ORGANIC GARDENING

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ORGANIC GARDENING—Emmaus, Pa.

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With The Editor

Free Fertilizers

A FERTILE soil means a live soil, and the word "live" as it is used here is meant to be taken in its exact, not literal, sense, representing real life. This life consists of bacteria, fungi, molds, yeasts and other tiny microbes. There might be a million of them on the point of a pin and each one is a living, reproducing entity. They serve the same function in the soil as do the bacteria in our intestines. Our digestive processes are decidedly not chemical but controlled by bacteria and other living substances called enzymes. While earthworms may aid soil microbes, it is the latter which constitute the real digestive power of the soil.

The more fertile a soil is, the more microbial life it contains. Any textbook on fertilizers will admit that; and the more that artificial fertilizers are used the lower will become the micro-organic life in the soil. At the Rothamsted Agricultural Station in England tests were carried out and bacterial counts were made under varying conditions. Where farmyard manure had been used 28,860,000 bacteria were noted per gram of soil. Where chemical fertilizers were used the bacterial count was down to only 15,100,000. There is no argument on the point that the application of animal manures to the soil increases the number of microbes per gram of soil. Where poison sprays are added there is a further serious reduction in the soil's microflora.

There is available a host of fertilizer material furnished free of charge by Nature but if the soil is not in the proper condition of receptivity, if it has been soured up and hard-packed by the overuse of strong chemical fertilizers then much of it will be lost.

Let us take the case of the bacteria themselves. In a very fertile soil the amount of bacteria in an acre may weigh as high as 600 pounds. When they die, their decaying bodies immediately turn to the richest humus. When you consider how fast they multiply and die the annual contribution from this source must be no mean sum. The richer the soil is in organic matter the greater is this total. Where the fertilizer emphasis is mainly on chemicals much less help may be expected from this source.

Let us take the earthworm as another example. By actual counts it has been discovered that where synthetic fertilizers are used the angleworm population declines, sometimes almost to the vanishing point. Now, this beneficent earthworker has a very short life-span, probably not more than a year or two, so that in a fertile soil hundreds of thousands of them are dying per acre each year. Can you conceive of a more valuable fertilizer material than the dead bodies of these creatures? It has been stated that such dead bodies may amount to over 500 pounds per acre per year and this consists of the most wonderful protein matter, as well as valuable mineral matter of the highest quality for plant nutrition. In such a fertile soil the microbes will break such bodies down and make the matter almost instantly

available for the feeding of plant roots. A few hundred pounds of dead bacteria per acre added to the weight of dead earthworms should be a wonderful source of live fertilizer material.

The earth is teeming with other animal life—spiders, beetles, ants and hundreds of others which are constantly dying and enriching the soil with their dead bodies. I know of no tests made to discover the effect of the use of chemical fertilizers on the total amount of such life but it would seem to me that the use of the poisonous, sulphurous fertilizers would put a clamp on their activities and substantially lower their numbers.

Then there is the excremental matter voided by these insects and earthworms. In the case of the latter Darwin has estimated that it amounted to ten tons an acre. Others have given figures as high as 25 tons. The Connecticut Experimental Station found that these earthworm castings contained five times as much nitrogen as that contained in the topsoil, seven times as much phosphorus, eleven times as much potash and three times as much magnesium. The picture is building up rather nicely, don't you think? But this isn't the half of it. Nature still has more tricks up her sleeve.

One of the most valuable sources of organic matter in the soil is the dead roots of old plants. In the case of a two-year-old crop of red clover these roots amounted to over three tons per acre and were found to contain 180 pounds of nitrogen, 71 pounds of phosphorus and 77 pounds of potash. Roots, not being too bulky, decay readily and the place they occupied remain as channels to aerate the subsoil. This does not take into consideration the above-ground residues of crops which in some cases would amount to two or three tons per acre of the finest fertilizer material. This green matter contains everything needed in the plant's nutrition.

Lightning should not only be charged up on the negative side of the ledger. Every time it strikes it turns the nitrogen of the air into a form that makes it available as fertilizer after the rain washes it into the soil. Somewhere over the world lightning is flashing fifty times every second. It has been estimated that lightning produces 100,000,000 tons of nitrogen every year and all of this becomes available in the soil as a fertilizer.

The rain washes in sulphur and other valuable elements that float in the atmosphere. Studies have been made that show that at least 40 pounds of sulphur are washed into the soil per acre per year by rain. Large quantities of dust are thus also washed into the soil. A very interesting factor is that each gram of dust teems with beneficial microbes, and also contains lime. A study made in the city of Berlin, Germany showed that ordinary street sweepings contained the equivalent of high-class manure. In the March issue of this magazine will appear a discussion of the fertilizer elements obtained from the dust and atmosphere, reprinted from Bio-Dynamic Farming and Gardening, by our contributor Dr. Ehrenfried Pfeiffer.

Snow adds its share to the soil's nourishment and that is why it has been termed "the poor man's manure." It is rich in nitrogen and has an affinity for phosphoric compounds. If you have the time it isn't a bad idea to shovel snow onto compost heaps.

The rocks that underlie the soil's substrata are continually weathering to form new soil, but this merely offsets surface soil erosion. It is the loose rock near the surface that may be more valuable than is generally thought. It not only gently disintegrates to form fertilizer, but serves other valuable purposes, such as to provide warmth, aeration, etc. You may be surprised to see marvelous crops of corn growing in fields strewn over with stones in great profusion. Many old books on agriculture caution gardeners against making a too clean seed-bed by cleaning out all small rocks.

To understand how helpful Nature really is we must understand that the plant obtains only about five per cent of its nourishment from the soil. The remainder comes from the air, from water and sunshine. This five per cent consists of the valuable mineral matter that the plant requires. So here we have actually 95 per cent of the plant's food that is on the free list. It consists mainly of carbon dioxide and nitrogen. Most of it is captured by the leaves with the aid of the sun. Some of it comes from the soil, air and water into the roots. If you add chemical fertilizers and organic matter you have a more or less complete picture of the elements that enter into the plant's nutritional equation.

Where the farmer decides to embrace modern agricultural chemical science to the extent of using more and more synthetics and less and less manure he gradually bleeds his soil to death. It is nothing short of that. First he kills off in cold blood quadrillions of bacteria and fungi. By failing to give the land its quota of organic matter each year, the roots forage about in search of existing living matter in the soil, thus eventually reducing it to the vanishing point. It's powers of digestion become feebler with each succeeding year.

The tilth eventually suffers severely. The surface becomes impervious to the rushing rains. The soil sets hard. This makes it difficult for the soil's economy to take full advantage of what Nature offers free of charge. On the other hand, where no strong chemicals are used and where the soil is constantly enriched with composts, the stage is set to accept gracefully and efficiently every item in Nature's free cafeteria of fertilizer foods.

J. I. RODALE.

Take the Initiative

QUITE OFTEN, a reader asks us to write to some organization to spread the organic idea.

Quite as often we reply that it is best for the readers to write on their own.

Think of how much more effective *tens of thousands of letters* from our readers are than *One* letter coming from the office of Organic Gardening. If such letters are spontaneous, not suggested by us, they are twice as effective. Let therefore everyone write when he sees an entry for the organic idea.

The *New York Times* reported a short while ago about the Cancer Center, which was started with a $4,000,000 endowment by General Motors. Some of the Cancer research is done at the University of Wisconsin. The purpose of the work is not only curing cancer, but finding the causes.

Here the question of fertilizer treatments should enter; the cancer research Institutes should see if the increase in cancer is not due to faulty growing of food crops, if organic methods would not curtail the cancer rate. It might be best to bring this matter to the attention of the founders, especially, Mr. Alfred P. Sloan, Chairman of the Board, General Motors Corporation.

Compost and Healthy Soil

By Sir Albert Howard, C. I. E.

THE EFFECT OF SUB-SOILING

(This continues the article in the January Number)

A FIELD—5 to 10 acres in area—under permanent grass should be divided fairly into two equal halves, one half sub-soiled 18 inches deep and 4 feet apart by a Ransomes sub-soiler drawn by a caterpillar tractor. The sub-soiling cuts to be in the direction of the slope and provision made to let out the water which collects at the bottom of the field into a ditch. This is done by a few sub-soiling cuts near the ditch at right-angles to the slope and a few pipe outfalls.

The other half of the field should be left alone.

The reaction of the grazing animal should then be watched. The cattle will graze the sub-soiled half down to the roots and only pick over the other half of the field.

EXPERIMENT II

Humus plus Artificials versus Humus Alone

Another field of 5 to 10 acres under permanent grass is required. This should be divided fairly into two equal halves, the parts being separated by a temporary electrified wire fence.

One half should be manured with a dressing of a complete artificial manure suitable for grass: the other half by an equivalent amount of freshly made compost.

We should then have a comparison between humus plus artificials and humus alone. Under the whole of the grass humus is constantly being formed. The milk yield of cows on the two halves should be recorded and the reaction of the live stock to these two sets of grass watched. The humus half should be grazed first; then the humus plus artificials half. The milk yield will go down when the cows graze the latter and they will try to break out into the former plot so as to obtain the sweeter herbage.

EXPERIMENT III

Quality in Wheat

Two fields of wheat should be grown, one with freshly prepared humus, the other with artificials. The grain should be stored in the same granary and rats should be allowed a free choice of the produce. They will always select the wheat grown on humus.

Samples of these two kinds of wheat should then be made into bread from a straight whole-wheat flour produced by an ordinary Bamford Mill. The difference in quality must be experienced to be believed. The bread from organic farming is immeasurably superior to that from artificials.

The straw from these fields should be used to thatch a roof. That from the humus field will last about twice as long as that from the chemically manured field. The Earl of Portsmouth has already done this experiment on his estates near Basingstoke.

EXPERIMENT IV

The Reaction of the Earthworm to Humus and Humus plus Artificials

A field under permanent grass of 9 to 12 acres is needed for this experiment. It should be divided equally into three plots. The middle plot should receive a dressing of complete artificials (the nitrogen being given in the form of sulphate of ammonia). The two other plots should be manured with an equivalent dressing of freshly made humus.

The manuring should be repeated for at least three years.

The reaction of the earthworm should be noted. This can be determined by watching the mole hills. These will disappear from the central plot because the sulphate of ammonia will kill the worms and the moles will always avoid this plot.

The importance of the earthworm in manuring the crop is proved by the composition of the casts. These are five times richer in combined nitrogen, seven times richer in available phosphate, and eleven times richer in available potash (Lunt and Jacobson, *Soil Science*, November 1944).

EXPERIMENT V

Organic Farming and Foot-and-Mouth Disease

This experiment under present conditions can only be carried out by the A. R. C. because it is against the law to move animals afflicted by foot-and mouth.

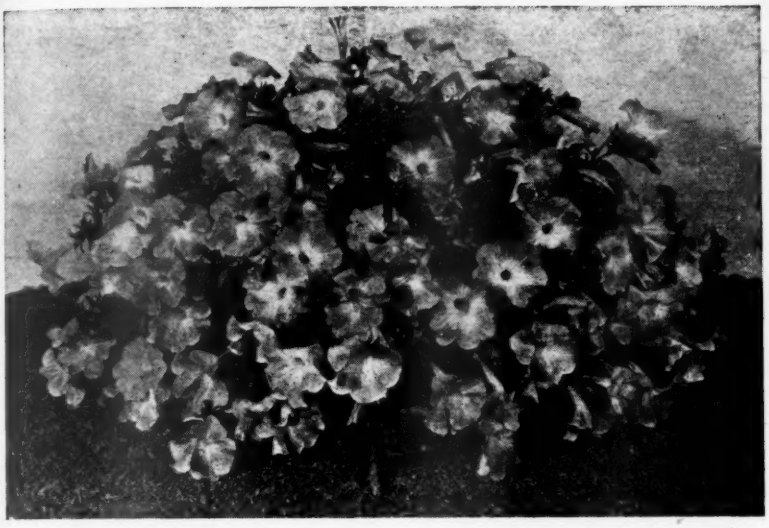
The estate at Compton in the Home Counties recently acquired by the A. R. C. for investigations in animal diseases is suitable for this experiment.

A portion of the estate should be got into first-class condition by the help of organic farming only. No artificials of any kind should be used on this area. Mixed farming must be practised. The reform of the manure heap must be undertaken and farm-yard manure replaced by properly made compost. All available vegetable and animal wastes must be used up. The land must be sub-soiled, drainage attended to, and the leys must always include: (1) deep-rooting plants as recommended in Elliot's *The Clifton Park System of Farming*, and (2) herbs. When the land is in such a condition of fertility by means of organic farming that it shows no appreciable reaction on small test plots to a dressing of complete artificials, it will be ready for the experiment.

This consists in letting loose a few foot-and-mouth cases among the herd of cattle which must consist of breeds suitable for the locality and which must be in the best possible fettle. This is what will happen. There will be no infection or at the worst only the very mildest attack. The diseased animals which have been introduced will soon recover. This dramatic result will accomplish three things: (1) it will sweep the slaughter policy of the Ministry of Agriculture into the dustbin; (2) it will establish the importance of humus in health, and (3) it will lead to the reform of veterinary education.

To ensure fair play it is essential that a land owner like the Earl of Portsmouth should be permitted to repeat this experiment on his own estate, the out-of-pocket expenses being met from the funds at the disposal of the A. R. C.

I have already put such an experiment to Professor Dalling, one of the veterinary advisers of the Ministry of Agriculture. He said it provided him with food for thought. The results most certainly would.



PETUNIA BRIGHT EYES — W. Atlee Burpee Co.

Old Fashioned Flowers—The Petunia

By DORIS CLARK

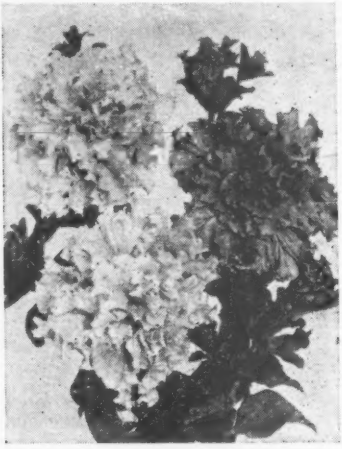
THE nightshade family has over two thousand species, some of which are climbers, some even small trees, many endowed with poison, and a great many with beautiful flowers. One of the nightshades is the well known potato, another one the egg-plant, while the tomato is a close relation. There are the Chinese Lanterns, the Jerusalem-Cherries, the Peppers, the indispensable tobacco (or so it seems); the Cup-Flower; the Nicotiana, which Helen Van Pelt Wilson recommends so highly as a desirable annual amidst the flowers of the perennial border; my favorite, the enticing Salpiglossis, and our old standby, the Petunia.

Even the average petunia packet contains mixed seed as regards the habit of the plants, however pure the shape and color may otherwise be. I sowed at one time a packet of beautiful dark purplish, velvety petunias in our Texas garden, then transplanted some of the strongest plants to an edge of the bed where the plants had ample opportunity to spread and also to benefit by my irrigation system. Of these plants, one turned out to be a perennial while the majority died down after their season of profuse bloom. This was a surprise to me then, but I have since learned that petunias are not necessarily annuals. Just the same, the average gardener will treat them as such.

With petunias I always have one problem and I fancy many other gardeners find themselves in the same boat with me. From last year's plants so many seeds are saved or dropped and so many little plants spring up that I never know what to do with them. Yet I hate to destroy anything that grows. At the same time, I have learned from sad experience that petunias in the course of time become paler and more faded every year, until at the end, they

approach white without ever getting pure white. I have never yet obtained a fancy ruffled petunia or a gorgeously colored hybrid from these accidental mixtures. So I have learned how to steel myself against undue leniency and to start my petunias every year on fresh seed.

Fortunately, there is always a great variety of petunias from which to choose. The W. Atlee Burpee Co., which had previously given some splendid marigolds to my flower garden, went into Petunia breeding with



W. Atlee Burpee Co.
ALLDOUBLE PETUNIA
"Colonial Shades of Rose"

equal success and received two All-America awards and one honorable mention for their new 1946 introductions, which are shown in the pictures. "Colossal Shades of Rose, Alldouble Petunia" represents the biggest double petunia ever known, many flowers being five inches across. The coloring is a variety of rose and mauve tones. "Bright Eyes" is a dwarf compact plant, very rich in flowers of a light rose pink color, while "Peach Red", another compact plant of twelve inches height has flowers of an intense medium-pink or warm peach red. Other growers and dealers have other good varieties, but I think it a good policy to try new introductions occasionally, especially if they have been tested and given a national award.

Petunias have, under natural conditions, a tendency to expand. Once they have started their growth in a good humus outside, they keep on spreading well until after the first frost. This habit makes them so valuable for window boxes and balconies and for highly raised beds, where they can alternate and contrast with the golden flowers of nasturtium. But quite often we do not need a dangling gawky plant, we cannot allot enough space to it, we want a sturdier growth, a more compact, bushy plant. And thus nasturtiums as well as petunias were selected for dwarf and semi-dwarf varieties of compact growth. Now, every gardener can choose according to his or her needs and requirements. On the whole, I prefer the mass effect of spreading petunias and am interested in colors rather than habit of growth, but I realize that many gardeners have less space and different ideals.

Some of my good friends like to tease me on my country tastes. But I simply cannot get myself to look at a garden plot as if it were a job for interior decorating or an advertising lay-out on rugs or curtains. No doubt, some very tasteful gardeners achieve great and startling effects by proper blending of colors, repeating the same color combinations two or three times, and limiting themselves to a certain group of predominant colors, a color scheme. I always think that Nature has produced all colors and so I like them all and since I have a country garden, its oldfashioned abundance in color ought to be quite in keeping with the style.

As said before, petunias make a good blend with nasturtium, especially since both are continuous bloomers, of great vitality of growth, and complementary—the petunias on the blueish and purplish band of the spectrum, the nasturtiums on the yellow and orange side. Instead of a pure blue, such as some new morning glories display, the blue of petunia

is always covered with red, and therefore purple in quality. Instead of a pure yellow, like some cosmos and calendula and especially some snapdragons, the nasturtiums cover a considerable range of orange shades and thus have just the same variety of color in their line as the petunias have on their band—which makes for variation and unity at the same time. Nature does the blending and produces unexpected effects, not the choosy gardener.

Among the rose-colored petunias, from which the blueish hue is almost completely eliminated, we find good contrasts to both white petunias and to mixed colors of snapdragons. Altogether we should keep in mind that mixing colors of one flower produces a better picture than mixing similar colors of different flowers. I had a row of petunias growing against a stone wall, gray with age, and its beauty was best set off by a mixture of red, purple and white petunias, just as later the unplanned mixture of chrysanthemums of all colors had again the same ideal effect of unity in variety. I have gone so far as to plant clarkia, larkspur and petunias together, interspersed with snapdragons, wallflowers, and a few nasturtiums. Obviously, the red and purplish and blueish tones dominated over the yellow and orange ones, but I derived great satisfaction from the fine transitions of blue and red in larkspurs and petunias, with the more fuchsia-colored clarkias nearby for emphasis.

A symphony in blue and a symphony in yellow need not be necessarily poor taste just because contrast planting is more customary! You might try it out for yourself, if you dare, and I venture to say your neighbors will admire your garden. The petunias offer the best raw material for the purple garden and their only shortcoming is that they take some time before they come into bloom. They are not a spring flower, but a summer bloomer. Thus, you can have them right over your tulips and narcissi. If you use the spreading kinds, your old leaves will be completely covered in no time.

The ruffled and double petunias with beautiful veins, plants that compare in individual perfection with salpiglossis and pansy, are not nearly so well suited to mass effects and color symphonies. Each plant is a little concerto of its own, and accordingly you want to plant these in such a way that you can watch them individually. I have about decided to remove the perennials around the

W. Atlee Burpee Co.

PETUNIA PEARL RED

house where they have been growing with profusion for many a year and to put in new rich soil and make a petunia bed. There I shall plant these compact beauties which the breeders have developed during the last few years. My only fear is that next year I shall have their seedlings there, and I know I shall be curious how they turn out. If they are not so good as their parents, the house will not look so nice. But I will try and hope. And I am always rewarded for my trust, for nature does not really know failure.

Where Insects Go In the Winter

By RICHARD HEADSTROM

INSECTS are so abundant during the summer months and so conspicuous by their very absence during the winter that those of an inquiring mind might quite naturally wonder as to what happened to them.

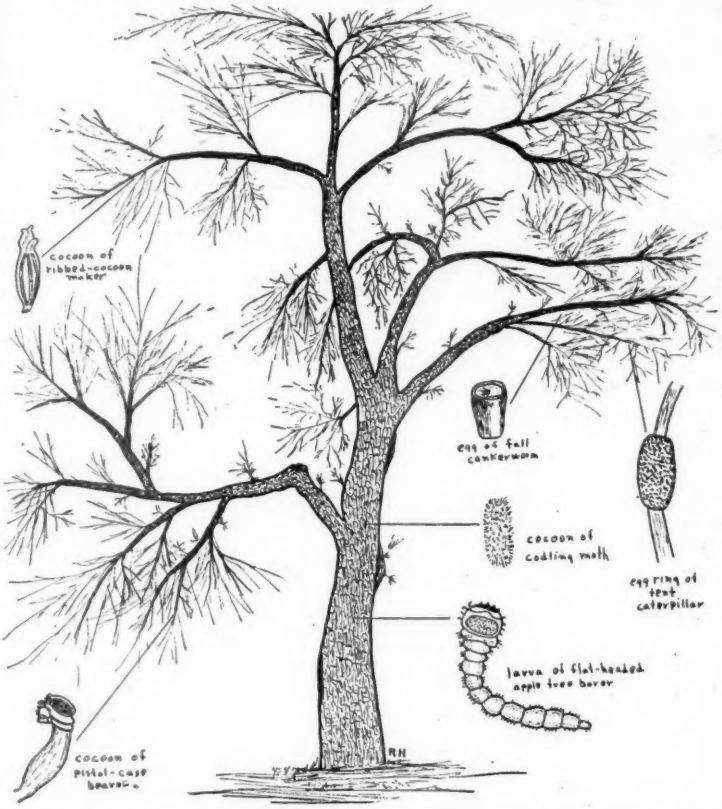
To find the answer all we need to do is to poke about a bit among some dead leaves or look inside some rotting log or examine the crevices in the bark of almost any tree. In such places we would find eggs, caterpillars, cocoons, and even adults for though many insects seen during the summer months as adults have simply died, many others have crept into some sheltered nook to hibernate. Indeed, if we pursued the matter rather fully we would discover that all sorts of conceivable places are sought by insects as winter quarters—grass tussocks, converging grass blades, roots, green leaves such as those of mullein and strawberry, twigs and stems, crevices and furrows of bark, crotches of branches, woodpecker borings, fungus growths, worm-eaten fence posts, fallen leaves, rotting logs, attics and basements, and even the soil itself—any site that may possibly shelter them from cold and the elements is utilized as a refuge. Some insects, disdaining a ready-made refuge, provide one by weaving together some leaves and spinning a silken cocoon within them—a flimsy-appearing structure to be sure but one which, nevertheless, is strong enough to be buffeted about by the winter winds and warm enough to protect the sleeping insect curled up inside.

The apple tree is our yard, its naked branches forming a grotesque outline against the sky, may have, surprisingly, a winter insect population of as many as 14 species. We would expect to find on the twigs, should we examine them carefully, the green to black shining eggs of the rosy apple aphid or the black shining eggs of the green apple aphid, or both. Also, perhaps, those of the apple grain aphid. On the twigs, too, we would be sure to look for the tiny flower-pot-like eggs of the fall canker-worm and the characteristic varnished egg rings of the tent caterpillar, to say nothing of the pistol-shaped cases of the pistol-case bearer, in which the larvae hibernate, and the white-ribbed cocoons of the ribbed cocoon maker containing the pupae. Then near the buds we would hunt for the tiny hibernaculae of the bud moth, in which the larvae pass the winter.

In the crevices of the bark, we would search for the purplish, elliptical, slightly curved eggs of the woolly apple aphid, although these are laid, as a rule, on elm rather than apple trees, and under the scales of the bark for the white eggs of the oyster scale, the eggs of the buffalo tree hopper, and the cocoons of the codling moth. And living in unseen burrows in the wood there would doubtless be the light-yellowish larvae of the round-headed apple tree borer and the light-yellowish larvae of the flat-headed apple tree borer.

Our apple tree is not unique in having an insect population at this time of the year. Almost any tree might be used by various insects as a place to spend the winter; and they do not all necessarily seek the sheltered crevices, such as are provided by the bark, for the caterpillars of the promethea moth spin cocoons which they wrap within the leaves of such trees as wild cherry, sassafras and tulip and which remain attached to the twigs where they are exposed to the fury of winter storms. The sacs of the bagworm, each containing a clutch of eggs, are fastened to the tips of cedar and arborvitae twigs and are likewise exposed So, too, are the nests of rolled leaves of the viceroy butterfly, containing the young caterpillars; the cocoons of the cecropia moth; the small firm-webbed nests of the brown-tail moth, in which live the reddish caterpillars

not more than ¼ inch long; and the nests of the silver-spotted skipper butterfly. More sheltered than these, which are all fastened to twigs, but still exposed to wind, cold and snow are the egg masses of the gypsy moth and of the white-marked tussock moth, which are attached to the bark of trees. Both of these egg masses,


cocoon of ribbed-cocoon maker
egg of fall cankerworm
cocoon of codling moth
egg ring of tent caterpillar
larva of flat-headed apple tree borer
cocoon of pistol-case bearer

however, are protected from low temperatures, the former by scales from the female's body and the latter by a white frothy material which the female distributes over them during oviposition.

Some insects are more fortunate than these and really spend the winter in sheltered retreats. These are the ones that normally spend their larval existence in the trunks of trees and which remain there during the cold season. To name a few we might mention the larvae of the sugar maple borer, which live in burrows in the sapwood of sugar maples; the larvae of the locust borer, which dwell in shallow galleries in the wood just beneath the bark of the locust; the larvae of the painted hickory borer, which tunnel in hickory trunks, the larvae of the bronze birch borer, which hibernate in galleries beneath the bark; the strong-jawed larvae of the long-horned beetles, which live in tunnels of various trees; and the engraver beetles, which fashion the patterned carvings seen on so many trees from which the bark has fallen.

Most of the insects that winter in living trees are small. This would be more or less expected for only small insects would be able to pick their

way into furrows of the bark, to live in woodpecker borings or fungus growths, or to find shelter in the crotches of branches. Lacewings are a case in point, large numbers of them having been taken from a single crevice in a fir tree. Common lady beetles and elm-leaf beetles, which hibernate as adults beneath the bark of trees, are small and so too are the ribbed pine borers which hibernate in pupal cases under the bark of pine, the squash lady beetles which pass the winter in tree holes and the carpenter ants which often winter in the dead centers of living trees. These are but some of the insects that spend the winter in trees and yet these examples may fall short of showing how many insects hibernate there. Perhaps the best evidence of the number of insects that may be found on trees in the winter is the vast quantities which birds find on them, and as a concrete example consider the downy woodpeckers. These birds forage chiefly on living orchard trees during the winter and of the food they find there 77% is animal, chiefly insects.

Such a bleak location as a fence, strangely enough, has a winter population of insects, especially weathered fences with rotten "worm-eaten" posts. Such holes may harbor dozens and even hundreds of lady beetles, Colorado potato beetles, twelve-spotted cucumber beetles and stink bugs, while carpenter ants usually hibernate in the tunnels which they have made. Insects that hibernate in fences are species that would hibernate in any place that would offer them shelter irrespective of food and the same thing is true of those that find refuge in houses, barns and other buildings. Elm-leaf beetles, for instance, feed on elm leaves but when the cold weather sets in they invade attics, and crickets which are found in fields go into basements. Common lady beetles, squash lady beetles and mourning cloak butterflies frequently seek shelter in buildings, which might seem surprising for such insects are usually found in the summer in gardens and fields and it would seem that they could find hibernating quarters nearer at hand. It is no denying that buildings do provide excellent shelter as is shown by the number of insects that pass the winter in them. Houseflies, bluebottles, paper wasps and mosquitoes are among this number but since these insects spend the summer about buildings it is what we would expect them to do; it would be surprising if they sought winter retreats elsewhere. Also included in the number would be such household pests as cockroaches, bedbugs, carpet beetles, clothes moths and others.

One of the best situations in which to spend the winter, from the insect's point of view, is beneath the leaf cover in woodlands for the curled edges of fallen leaves form millions of cups that hold the warm air within it, and when once the topmost layers are coated with frost high temperatures are even better maintained. Many insects instinctively seem to realize this and as the temperature begins to drop begin to migrate downward from plants on which they have spent the summer and crawl beneath the fallen leaves. A few such migrants are leaf hoppers, tarnished plant bugs, stink bugs, soldier beetles, flea beetles, three striped potato beetles which hibernate singly or in clusters, and lady beetles which huddle together sometimes by the thousands.

Like the leaf cover, logs similarly offer excellent protection against low temperatures. We do not, however, find the same species of insects hibernating in all logs; we might examine a dozen logs and find a different insect population in each of them, and, varying according to the exposure, texture of wood, amount of moisture and looseness of bark. In logs having slightly loosened bark, we would find under the bark the leaf-like flat bugs of the family Aradidae and the equally flat cucujid beetles and very few others but in logs on which the bark hangs loosely and in which the wood is softened to a pulp we would come upon a veritable community of in-

sects—the thick-bodied larvae of fireflies, click and darkling and rove beetles (which spend most of their lives in such logs anyway), adult muscid flies, bluebottles, ichneumon flies, pompilid wasps, Isabella caterpillars, termites, the nymphs of wood cockroaches, tiger beetles and adult ants which often forsake their summer nests and push their way into powdery, rotting wood where they gather in tight bunches of dozens or hundreds, the outer ones shaggy with ice crystals. Hollow logs, too, are not without their occupants for in such places, red admiral and tortoise butterflies spend the winter.

Many insects that we find on the surface of the ground during the summer as a rule go below the surface on the approach of cold weather, while those that summer below the surface remain in their places or go deeper. Field crickets, red-legged grasshoppers and the Carolina grasshoppers pass the winter as eggs which are deposited in the soil; the larvae of many beetles, the "white grubs" so common in garden soil, dig down below the frost line; the larvae of the black digger wasps often fashion cocoons in the soil in which to pass the winter; adult cabbage curculios and Colorado potato beetles also find winter quarters in the soil, as do a number of scarabeids; while insects, such as the larvae of wireworms and the mound ants, which live in the soil during the summer prefer the warmer temperatures of a lower depth.

We have as yet by no means exhausted the likely places which insects use as winter quarters. Under garden litter, for instance, we might find asparagus and bean-leaf beetles and in grass tussocks and among grass roots a vast number of small insects. Open fields are usually not frequented by hibernating insects and yet in a field not far from a garden or orchard almost any grass tussock would probably yield strawberry and raspberry weevils, snout beetles, squash bugs and others, and if mulleins are growing there ants, true bugs and thrips would likely be tenants in the woolly leaf rosettes. Lacebugs, which we would easily recognize by their netted gauze wings, might be discovered hanging under spreading strawberry leaves, chinch bugs in bunch grasses, and if we looked on protected hillsides we might uncover young green-striped locusts wedged down close to the roots of the grasses.

Galls—those peculiar outgrowths or excrescences which we find on almost all plants—often serve as winter quarters for their makers. The galls which are so conspicuous on goldenrod stems if cut open would in all likelihood be found to be tenanted—the oval galls by the adult gall moths and the spherical galls by the larvae of the fly *Eurosta solidaginis,* and if, perchance, their makers had long since left they would probably be occupied by other small insects. The hickory gall, the blackberry knot, the "mossy rose" and the pine cone gall would likewise be tenanted by their makers, the pine cone gall having in addition to its maker numerous minute cecidomyid flies which have wedged themselves in between the scale-like leaves as guest hibernators. Many other herbaceous and woody plants of low growth also provide winter quarters for a variety of insects. The raspberry-cane borer passes the first winter of its larval life within the pith of raspberry canes, the larvae of the cat-tail moth winter in cat-tail stalks and the larvae of the European corn borer in old corn stalks.

Surprisingly perhaps, but we should not be apt to find many insects under stones which we can overturn easily or under boulders where they must tunnel into the hard earth because in such situations they can secure only moderate protection against the cold and little food. We do sometimes, however, find insects beneath stones but such as we might discover would probably be adult beetles, which are either completely dormant or semi-dormant, in the latter instance feeding on other insects which might be found with them.

Hedge Row Observations

By HEINRICH MEYER

NOW that winter frosts have struck our region, late in November, I have put on gloves and taken a hatchet in hand to clear my property of poison ivy. Whatever winter does to the acid or oil that causes blisters, it has been my experience that I don't get poisoned when the air is dry and the weather cold. In a way, I had been looking forward to this job, because it is easier than some of the hard labor we farmers and gardeners do at other times and because I enjoy the leisurely work in the fence row. So many thoughts come to mind, so many observations hit us, and so many fertile deductions can be drawn when we watch the natural growth around our cultivated fields. Perhaps, there is nothing original in these thoughts, but not all that is new is good and much that is as old as the rocks is safer for our daily guidance.

Our readers recall the article by J. I. Rodale on Stone Mulch, an article that brought forward considerable response from readers eager to experiment or already in a position to relate experiences. If the stone mulch idea finds any support in nature, I can certainly tell of it: My fence row is nothing but one magnificent stone mulch. Let us look into that matter a bit more closely.

These old-time Pennsylvania farmers must have been pretty busy, moving thousands of heavy boulders and tens of thousands of stones from their fields toward the property line. Lifting some of those pieces on a wagon is not an easy job and, prior to the times of modern power equipment, the job was still harder and took even longer than now. But there they are, stones of all shapes and of various composition, which it would take a mineralogist to determine. Some have the rounded form that boulders in stream beds acquire, others are sharp-edged, but their color in the hedge row is invariably gray, sometimes etched with black from the humus or humic acids which envelop them.

In the row grow all sorts of shrubs and trees, among them some fine hickories, a row of sour cherries, an oxheart cherry, and plenty of choke cherries, here and there an elderberry bush, a sumach, all stages of black raspberries, and considerable tangles of poison ivy and Virginia climber. In summer and fall, of course, the more common annuals and perennials of the weed flora also raise their flowers, but they are a little closer to the edge

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WHITE OAK
By Helmut Siber

In the Pocono mountains of Pennsylvania, Siber has been watching nature in its various forms. The neighbors consider him a weather prophet in his own right. After years of study at different European academies, Siber traveled in the Orient and published a set of lithographs of Chinese temples. He then drew and painted in India. Since 1930, the Northern skies of Pennsylvania have inspired Siber's new technique in water color. Every conceivable scene of lake and landscape with storm clouds rising, gentle spring breezes, high cirrhus and menacing cumulus clouds, was captured by his brush and his palette of seventy-two colors. We are happy to introduce the master through a crayon drawing of a WHITE OAK.

and rarely crop up among the stones themselves.

In pulling up poison ivy, I was again amazed at two features: First, how easily these roots break. Even the thickest of them can be broken off with a twist of one hand. This would naturally help these plants to propagate easily. If torn in one spot, a runner will root in another place. The second surprise was, as always, the ability of poison ivy to get along without real "earth." The roots, especially the subsidiary roots that come out on the trunks of the poison ivy plants, cling to decaying woody material or to trees and sap moisture from this organic substance; but where there are no organic residues, the roots are satisfied with feeding on stones which they encircle or cover with fine networks of rootlets. This is probably one cause of the successful growth of poison ivy: Its acid dissolves stones and extracts minerals from boulders, once these stones have been subjected to weathering, moisture, and the influence of humic acids.

As we remove some stones on top of the row and yank up some poison ivy roots, we find that the spaces between the stones are half filled, loosely taken up by a spongy, moist, black mass of leaf mold, raw humus pure and simple. It is easily seen that this material is acid and therefore able to break down, however gradually, the surrounding stones. Whether the resulting nutritive elements are on the acid side, would have to be tested carefully, since the old decayed matter farther down is necessarily more balanced than the fresh leaf mold and since, after a rain, the acids from the top would be washed down to lower levels. As we remove more and more stones, we not only bare greater tangles of roots, but gradually come to a felty mass of completely decayed organic substance. It is there that the climbers and brambles take their main nutriment, while the tree roots go still farther below into the soil underneath the hedge row and its stone wall.

Even before the agricultural journals had begun somewhat to disavow our almost superstitious belief in soil testing, I had developed certain suspicions concerning acid soils. It is known too well that plants are quite adaptable to varying soil conditions and that they must be thus adaptable if they are to survive without becoming too highly specialized. Very often a plant develops into two varieties, one suited to acid soils, the other thriving in alkali soils. Such separation is common among the grasses and sedges, it includes even corn, and is common to the rose family in general and roses in particular. But there are even legumes, fundamentally alkali-loving plants, that relish acid environments. Likewise these hickories of mine are doing very well under the acid mulch of leaves and the pressure of tons of stones, and the poison ivy does exceedingly well.

In looking about where I might find a competition of roots, I found myself at a complete loss. Smilax or greenbrier, Virginia Climber, wild grapes, poison ivy, raspberries, and various trees seem to be getting along side by side, protected by the warming air spaces and the leaf mold, sheltered against the sun by the piles of stones, and none of them in any particular need of great amounts of soil. Only one spot came to my attention, a spot where old tin cans and other rusty metal ware had been dumped for a generation or so—there no poison ivy succeeded, though the older trees were not affected. Apparently, the rust that washes down is not liked by poison ivy and any of the other hedgerow plants. Only burdocks squatted there with broad leaves and in satisfied possession of the untenanted space. Either, their roots reach down to a depth where iron oxide is no longer dangerous or they actually feast on rust.

This combination of minerals and organics, of decaying stones and decaying leaves, which we encounter in the hedgerow looks like a testimonial for the organic thesis. But when you consider that even to this day, no

chemist can clearly say what humus is, that the experts in this country as well as in Russia, where they devoted much work to this question, have not come to a definite answer, then such practical observations point at least the way until we have more definite knowledge of details. There is no doubt that humus at different stages of decay has different values for different plants. Long before plant residues, needles, leaves, trunks and branches come to that final stage of stability and balance, commonly associated with Humus, other plants feast on the disintegrating substance. Those plants which like raw humus, humus in an early stage of decomposition, foremost among which is Poison Ivy, may be a necessary stage in the plant kingdom's march of expansion.

It would be interesting to know whether a soil can become so developed or balanced that poison ivy no longer thrives. I have seen poison ivy on the banks of Buffalo Bayou in Texas, and Mr. Vines discovered a variety there which has more than the customary three leaves that are supposed to be the distinguishing mark of the poisonous plant, and I find again the same plant luxuriantly growing in my Pennsylvania hedge row. The Government experts tell us that a goodly application of borax will make the land disagreeable to this tenacious climber, but there are few places in nature where boron occurs in such quantities as to make life unbearable for *Rhus toxicodendron,* which is the Latin name of our species and which is also translated by Poison Oak. But I have yet to see a spot where poison ivy moves off on its own free choice because it does no longer like the composition of the soil.

If I were a chemist, I should make a careful analysis of the mineral contents of poison ivy and some other hedgerow plants surrounding my property. Maybe, this would give us some leads as to why certain plants seem to succeed anywhere. Last year, I tried to compost some of the uprooted material. While choke-cherries decay in no time, poison ivy faced the heat and the bacteria and the fungi of the compost heap without damage. True, the roots and stems are dead, but they are not decayed. If this property were used in medicine maybe, we would get another bacteria-killer or fungus-resister among our plants. This extreme resistance to organisms of decay is probably the very reason why poison ivy succeeds so well amidst the decay of the hedgerow. Is it not strange that many other bactericidal agents are derived from plants that thrive under similar conditions? The wild hop grows along the fences, the nut trees which envelop their hard-shelled fruit with a cover rich in tannic acid love nothing better than a mulch of leaves, though many plants will not thrive where walnut leaves cover the soil.

Those were some of the thoughts that passed through my mind as I pulled poison ivy. When I had two wheelbarrows full, I decided to start a bon-fire and get myself a cup of coffee inside to rest from the exertion. By that time, the easy work did not feel so easy any longer. Now there came another interesting observation! The fresh, juicy poison ivy roots and branches catch fire as fast as the driest branches we use for kindling. Off and on, there is a sizzle and a squeak as if a mouse were whistling. The flames rush over the material as they do over pine needles, with many little pointed bursts from exploding cells filled with oil or resin. Too bad, I cannot compost all these good organic things, but I certainly shall strew the ashes into the garden and make at least the minerals avilable which these climbers have hauled together amongst the stones and leaves of my fence row.

All-American Selections

FOR a good many years, the selections of the All-American Committee have resounded in the seed trade of the nation. If a new variety is introduced and tested in various parts of the country, it may well not get

DIANTHUS HEDDEUSIS
WESTWOOD BEAUTY
Bodger Seeds, Ltd.

the votes in all regions. But if it does, it must be pretty universally good. The highest choices are then the All-American Awards and Honorable Mentions. In Doris Clark's article on the PETUNIA, the flowers which got high awards were mentioned and shown.

Another highly praised All-American Honorable mention in 1945 was Bodger's new Dianthus, WESTWOOD BEAUTY. Bodger Seeds Ltd. does not sell to the individual customer, but will make its seeds available through the retail dealers, so don't order directly. President John Bodger writes me: "We believe this dianthus is the forerunner of a race of Dianthus that will make the old fashioned Pinks one of the most popular things the same as the Golden Gleam popularized the Nasturtium and brought it back to the home gardens once more." As Carnation and Dianthus lovers, both Doris Clark and I are highly excited over the new prospect which is shown in the picture. The Westwood Beauty is a cross between D. Heddewigi and D. Chinensis, combining the large open flowers of the former with the long stems of the latter. It is especially heat resistant and will do well in the South and West, but nevertheless also grow in the cooler climates. I am now curious how it smells. Its colors are shades of crimson and scarlet.

In the vegetable field there were numerous new breeding results. Landreth Seed Co., in Bristol, Pa., has developed a new canning tomato, the experiment stations are bringing out the new lettuce Slobolt and absolutely stringless beans. Beans are always important, and the Corneli Seed Co.,

LONGREEN BEAN
Roger Bros. Seed Co., Chicago, Ill.

in St. Louis, has three All-American beans to its credit: Keystonian, Florida Bell and Improved Commodore. The latter are 1945 awards. The 1946 award went to another bean, the LONGREEN. It has longer pods

than Tendergreen, in the ayerage, one inch. The breeders who harvested this cherished bean and the 1946 prize are Roger Bros. Seed Co., of Chicago. You will find their bean also announced in the catalogues.

It is only natural that the firms who wish to bring their seeds, the product of their breeding programs and enterprise, to our readers and who are advertising in our pages, should get first consideration from the readers. Advertising allows us to secure better pictures and a better magazine, but advertising is possible only if the readers buy from the dealers who appear on our pages. M.

Garden Calendar—February

Medium Temperate Zone: Now's the time to order seed and nursery stock. Trees may be planted as soon as soil is ready to dig. Do not mulch before they have well taken root, because mulches may at first cause young trees to rot.

Be careful about the buds if you prune; if a fruit tree has many water sprouts, it may be better to prune it after blossoming. Otherwise the sap will merely force new wild growths out of the tree.

By the end of the month you can start some seeds in your flats. Try a few new seeds. I liked the *Golden Jubilee Tomato* last year.

Air bulb beds if they are heavily mulched. Anemones may be planted, poppy, larkspur, mignonette, clarkia, pansy may be sown where the soil permits. Firm soil around plants that were heaved up by the frost.

Watch storage pits for mice, feed the birds.

Prepare hotbeds and coldframes for lettuce, cabbage, radishes, etc. Parsley, carrots, spinach may go in the open.

South: Vegetable Planting time, flower planting time, shrubs and trees. Consider new variations. Thin seedlings from fall plantings. Watch out for the unexpected February frosts. All early vegetables should be planted, the warmth-loving crops, such as tomatoes, peppers, eggplants must be started for sure.

Old Rule: St. Mathias breaks the ice,
But if there's none—he makes some. (February 25).

The Earth's Organic Cover

BURNING LEAVES

By H. C. HAAS

DURING the three weeks ending about November 6th of last year the writer had occasion now and then to drive his car through Scarsdale, N.Y., a suburb of New York City in which he lives. He took particular notice of the smokiness of the atmosphere, almost like fog, denser in some areas than in others. During those three weeks and the three weeks following nearly all those owning or occupying Scarsdale homes, surrounded with lawns and shrubbery of varying extent, were burning leaves, the leaves of the trees that are of so many colors before they fall, but are all brown on the ground. The leaf bonfires are often set on the street pavement where they cannot harm earthworms, but where the heat is sometimes intense enough to damage the pavement. "Leaf burners", woven wire receptacles to confine the leaves while burning, to give the fire more air and to keep the heat off the pavement, are sometimes used.

Tidiness, above all, is valued in Scarsdale, and a lawn littered with flying leaves is an unkempt lawn. The writer gathers up his leaves, sometimes not very promptly, has not burned a leaf for many years, has spaded them into the soil all those years, saving the major part for the compost pile during the last two years. A few neighbors compost or "dig in" their leaves, allowing most of them to lie about the roots of their shrubs, evergreens and hedges over the winter for protection against cold, then digging those in. The great majority burn most of their leaves when they fall, and some burn the rest in the spring. Leaves are considered as unwanted litter. They burn readily, having a large admixture of air when dry and curled up, and the resulting pile of ashes is of much smaller bulk. The burners of the leaves, while admitting that the leaves could be used to make good compost with considerable effort and time, comfort themselves with the thought that the purveyors of fertilizers, in the business for years, probably have the best advice. Why make fertilizer when you can buy it? Bought soil "enrichment" costs money but requires no storage, no labor except the sprinkling, and it is finely powdered, easy to handle.

The burning of leaves, the burning of all unwanted waste plant matter, called "tares" or "chaff" in the Bible, have been the custom and have had the sanction of mankind from the beginnings of civilization. Even the eminent Luther Burbank built "periodic $10,000 bonfires" in which he burned the inferior unwanted varieties resulting from his crosses, saving perhaps a dozen plants out of sixty-five thousand for further propagation. So Roger W. Smith has told us in Gardener's Book Club Pamphlet No. 6. It would seem that Luther Burbank burned more than he saved. Men were not told in his time that composting will disintegrate even seed, preventing the germination thereof. Luther Burbank wanted of course to eliminate every possibility of further growth of the unwanted varieties. In view of what he was able to accomplish, Luther Burbank could be excused of almost anything—we would excuse him less if he were to do the same today.

When Jesus spake the parable of the tares (Matthew 13, 24 to 30) to bring into the minds of his hearers the conception of heaven, he told how the reapers in a field were thus ordered by the householder—"Gather ye together first the tares, and bind them in bundles to burn them: but gather the wheat into my barn."

John the Baptist, telling his hearers of one mightier than he, "who shall baptise with the Holy Ghost and with fire" said of Jesus "He will thoroughly purge his floor, and will gather the wheat into his garner; but the chaff he will burn with fire unquenchable" (Luke 3, 16 to 18).

In the Common Service Book of the Lutheran Church, authorized by the United Lutheran Church in America, the words of hymn no. 484 are based on the parable of the tares spoken by Jesus. Stanza 3 has this:

For the Lord our God shall - - - - -
Give his angels charge at last
In the fires the tares to cast;
But the fruitful ears to store
In His garner evermore.

Heaven is being built. Let us hope this earth will be peopled with our kind for a great many generations to come. It may seem to most of us just now that upon this earth Hell is being built with TNT, flame throwers and that culmination in the development of man's ability to kill at a distance, the atomic bomb. Even in peace discontent and strife are rampant, to which all the strikes and civil wars attest. Prof. Harold Urey of Columbia University, Nobel prize winner, has these three sentences in a long letter in the New York Herald Tribune of Nov. 19th 1945:

"Without international control of nuclear explosives the world will find itself engaged in a desperate armament race, whose probable outcome will be an all-destructive atomic war."

"In absence of world government, is an effective international control of atomic explosives at all possible?"

"The task lies squarely on the shoulders of the responsible political leaders of the world."

It is a comfort to know that some men are thinking. Let notice be served on Luther Burbank, St. Matthew, St. Luke, John the Baptist and all the angels in heaven that the burning of leaves, tares, chaff and the like are a sin in the eyes of God. Likewise that the delivery of any human souls to everlasting fire and torment is not the intent of God.

The ancients did not know what we know—that the life-giving topsoil on which all men normally tread is normally filled with an enormous population, enormous in number because most of the population is exceedingly small—so small that the ancients could not see them, and, having no microscopes, could not suspect their existence. Pasteur's efforts served most to alarm humanity against the deadly microbe, bringing on a war against all the small life on earth—with sanitary drinking cups and napkins, sterilization with fire and antiseptics, the broadcasting of poisons, DDT the most recent and most effective, and the like.

All pathogenic (dangerous) bacteria are the enemies of men and animals, but, while we are destroying these, let it sink into our consciousness that there is a host of bacteria, m i c r o b e s, fungi, earthworms and others—Organic Gardening readers know what they are—that normally bulk almost as much in the ground as men and animals above the ground—also the birds and insects. It is only with the help of all this life that men and animals can continue to exist, whether they go to church and praise God or not.

If we are going to have peace and co-operation on earth between men, let us also have peace and co-operation between men and all that other life on earth that for more than a million years has been in partnership with men and animals for the continued existence of all. Just as the organs of the body perform each its own function in a co-operative whole, let it

be known that all the different forms of life on earth perform each its own function in a co-operative whole. Men and the animals and the birds and insects normally deposit their daily organic contributions and their final remains on the soil. The soil receives these, mixed with all the contributions of plant life, and digests them—as the juices in our stomachs digest our food. As Walt Whitman tells in that immortal poem "This Compost", all the filth and putrid matter that men, animals and plants deposit on the soil are transformed, are entirely changed in nature by the action of that life we have been killing with arsenate of lead, sulphate of ammonia and the like. The filth of thousands of generations has been used to make the sweet smelling humus that grows the flowers we love and filters our spring water.

The life in the soil hungers for all that civilized man has been withholding—those leaves included. As fastidious as my neighbors, I raked the leaves off our back lawn and found the ground, particularly over bare spots under the trees studded plentifully with earthworm holes. Some readers have told us that fallen maple leaves are good mulch for a grass lawn over the winter months at New York latitude. Those earthworms were denied by me further digestion of those leaves. The leaves are gathered into a big pile for composting next spring.

Civilized man withholds more than leaves from the soil. His own daily contribution is almost nil and his final remains are often encased, at expense in proportion to his means and desire to gloat, in enduring bronze or concrete, hewn stone or marble. Co-operation with the life in the topsoil? He never heard of it. He leaves that to the disappearing animals—disappearing, why? Due to his prowess with the gun, his mile-square fields without cover for any living thing, his broadcasting of poisons, his discovery that a ninety horsepower motor is better than one horse, his utter disregard of the rights of any life on earth but his own. The enslaved hogs, chickens, lambs and cows remain, and, like human beings of the wage earning class, are being regimented into the assembly line—the assembly line for the wholesale production of milk, eggs, chicken, lamb, pork and beef. They can't strike. But it has been shown by Dr. Parrett that these assembly line food products are not as wholesome in large measure as the food of the ocean, which as yet have not been blighted by civilization's advance. Their flesh not being wholesome, can their manure be otherwise than lacking in vital elements?

Strange it is that the only earthly creature which has imagined a heaven, shown it in pictures and written about it in books, has selfishly placed only himself in it, even with angels of only one skin color. It seems proper to admit into heaven all that life which is necessary to the existence of man—and there is only one place for it all—right where it has all grown during those billions of centuries.

Homo sapiens, the only creature who has ever used fire, has used that far too much! Nature normally produces fire only with lightning and volcanos and the organic cover normally contains enough water to quench fires. All living organic matter, animal or plant, all highly porous, is mostly water, excepting horn and shell for protective hardness, and hair, which cannot contain water because it is a protection against freezing. All deceased organic matter is normally set upon by the ground life which digests it.

Some think that we do not need the co-operation of the soil life—Certain agricultural experiment stations have found that we can grow food plants without it—using only water and selected chemicals, a grand discovery, revolutionary. Nature used that method before there was any humus. But that intricate supreme accomplishment of evolution called by himself "home sapiens" did not have to be nourished then. May he earn that title.

Are we all to drop civilization and become Tarzans? There is a middle

ground, let us hope, and 137 millions of Americans will have to find it, assisted by the rest of the earth's inhabitants.

The way to extinction of the race has been trod by civilization for many centuries, but the machine age has vastly accelerated the pace. The Babylonians and the Romans were fast workers but they did not have turbines and jet propulsion. We are using up the mineral wealth of the earth as fast as the organic without a thought that a heaven over an azoic earth will be a sorry place indeed. For it is posterity that Christ was thinking of when he said "Suffer little children to come unto me, for they are of the Kingdom of Heaven."

Chance Seedlings

THEO. A. STEPHENS is the editor and owner of the English Garden Magazine MY GARDEN. In the September 1945 number an interesting letter to this editor offers good thought food. A. T. Johnson writes that the unpromising weakling, the chance seedling, the plant that is cast aside may produce an outstanding plant in the end. He relates how E. C. Buxton planted the strongest of a batch of primula seedlings and threw the weaklings aside. "His wife took pity on the waifs and it was one of these despised leavings which eventually became the famous Buxton Double Blue Primrose, the finest thing of the sort ever raised."

The Church In the Green

COMMUNING with the animating spirit in nature is not really what we refer to here. We are merely looking for ecclesiastical connections in plant life. There's Aaron's Rod, Aaron's Beard, Solomon's Seal, Job's Tears, St. Joseph's Wand, St. George's Herb, St. James' Weed, St. John's Wort, St. Anthony's Turnip, St. Andrew's Cross; there are Angel-eyes, the Crown-of-Thorns, the Passionflower, the Christmas Rose, the Easter Bell, to attest to religious consciousness. The Clergy come in for Priest's Crown, Monkshood, Bishop's Cap and Bishop's wig and Bishop's Weed; the Nuns is also called Star-of-Bethlehem or Quaker-Ladies, and the orders have at least the Jesuit's Bark. Then we look to the negative side and find a Devil's Claw, Devil's Club, Devil's Bite, Devil's Gut, Devil's Fingers, Devil's Hair, Devil's Apple, Devil's Shoestring, Darning Needle, Walking Stick, Pitch Fork, and Head-in-a-bush, and even Devil's Grandmother. It almost looks as if the herbalists had a particular love for Beelzebub. But who knows? I often have wondered whether Black-eyed Susan was the one the old greybeards watched at her bath.

Gardening Thesaurus

ETIOLATION—*bleaching of green leaves, taking place when sunshine is excluded. Potatoes sprouting in the cellars are usually etiolated.*

ACHENE—*every botany book and most gardening books use certain terms to describe seed forms. An*

achene is a one-seeded fruit, which stays within its seed coat. Achenes do not have bursting seed coats, nor are they covered with flesh. A one-seeded fruit, a pit or stone, covered with pulp or flesh is called a DRUPE. A peach is a drupe.

COMATE—*endowed with hair. In horticultural language applied to seeds which are connected with hairy growths. These frequently serve as*

floating devices and produce wider dispersion of seeds. Hairy leaves are usually called HIRSUTE. When a leaf or stem is covered with rigid or bristly hairs, it is called HISPID. A bristle, such as appears on some grains, is called an AWN. If an awn is long, it may even get the name of BEARD. A short and sharp point is called MUCRO and a leaf of that kind is MUCRONATE.

MOUND LAYERING—*instead of staking shoots to the ground to produce roots, you heap earth over the*

plant. Hydrangea, spiraea, prune, etc. are thus propagated. First the new wood is cut down to last year's growth, then the shrub is covered with a mound of earth. By placing a wire or metal band firmly around the trunk or main stem, many more shoots are produced. Plants which produce runners freely, such as raspberries, dewberries, and gooseberries need not be mounded.

ADVENTITIOUS—*means as much as "suddenly arriving". The roots of*

a corn stalk forming at the first node, the roots of layered plants and of runners are adventitious roots. If a tree is cut down to a stump, adventitious buds frequently appear on the roots. These give rise to many new shoots coming up around the old trunk. While the old tree was in growth, these buds were sleeping or DORMANT.

STRATIFY—*means literally nothing more than "to spread out". The gardener stratifies the seeds of evergreens, apples, and other perennials that must undergo a winter freeze. A layer of sand is alternated with a layer of seeds, protected from mice, and exposed to the winter weather. Exposure to weather is called WEATHERING.*

HYBRID VIGOR—*a pure race is usually less fertile than a cross or hybrid. A cross between two different breeds of chickens grows quicker and produces more weight on the same amount of feed than the parents of pure strain. The plant breeder utilizes this natural trend, called hybrid vigor, in the production of hybrid corn. It yields more than the parents, but the seeds from a hybrid plant split up into the hereditary lines of the parents and are therefore not used.*

POLLARD—*the same as POLL, cut down to the head.*

Polled cattle are dehorned cattle, pollarded trees are trees trimmed down to the stem. Mulberries are sometimes pollarded; willows are, as the picture shows, pollarded for the purpose of producing many twigs, which are used for basket-making.

Hints for the Victory Gardener

This is the thirty-ninth of a series of articles by this author dealing with the cultivation of ordinary vegetables.

KALE, COLLARDS AND SEA KALE

By ROGER W. SMITH

FEW garden vegetables have been more changed by cultivation to fit various climatic conditions than has kale; yet, in whatever form you grow it, you will notice that kale more closely resembles its ancestor, the wild cabbage of Europe, than any other cultivated form of cabbage. Kale is a low-growing, non-heading form of cabbage.

Commonly called by many names, kale, collards, colewort, borecole, etc., all names stemming from "cole" i. e. cabbage, there are three main varieties of kale.

1. Blue Curled Scotch Kale, fifty-five days to maturity—is a low-growing, compost plant having finely curled, bluish-green leaves. It is resistant to cold to the extent that some frost seems to improve it.

2. Hanover Salad Kale, thirty days to maturity, also low-growing, but with smooth leaves—resistant to cold.

3. Georgia Collards, eighty days to maturity, with large, succulent green leaves formed upon a trunk-like stem. Resistant to light freezing.

Now whilst all three of these varieties will stand some cold, Georgia Collards is much more resistant to heat than either of the other two. Another important difference is this: Kale is grown usually in the northern States as an annual, seeded and harvested within a year; but Collards, since it can survive a mild winter, is best grown as a biennial. Because of this, Collards more often than not forms its leaves around the top of a fairly thick stalk, some ten to thirty inches in height.

From all of which you will see that the various strains of kale and collards offers you a wide selection of non-heading cabbage to be chosen from according to the climatic conditions governing your garden. In other respects the various types are about the same. The leaves may be stripped a few at a time as needed preferably before they are too old, when they become tough and woody. Kale is essentially a Fall or Winter vegetable.

In early Spring kale seed should be sown in drills thirty inches apart and the seedlings thinned to stand eighteen inches apart in the rows. The seed should be covered with about half an inch of sifted compost humus and carefully firmed. You will find that the seedlings removed at thinning time come in nicely as a Spring greens. If you need them they may be replanted to fill gaps in the rows or to form other rows.

Collards take longer to mature, and stand longer in the garden. The plants require more room than Kale plants. If you set the plants, or thin the seedlings, to two feet apart in the row and have the rows three feet apart, they will grow into fine, sturdy, uncrowded plants.

Plant disease practically never attacks either Kale or Collards. The same insect pests which bother all members of the cabbage family, es-

pecially aphids, cause more annoyance than damage in garden plantings. If you see that the plants receive ample moisture and plant nutrients and make these easily available by incorporating with the garden soil plenty of organic material, your plants will be husky and not seriously harmed by these pests. If they become numerous, a sprinkling of salt water will usually check them very effectively.

You might like to make a note that when these plants are seriously effected by insects it is usually a sign that they are not growing properly, that they are attempting to grow out of season, that there is something wrong with the soil, the surroundings, or the drainage. Sometimes insect infestation is a sign that the garden area was not properly cleaned up the previous season. All old plants, leaves, etc., should be cleaned up, removed and properly composted.

But if you can grow heading cabbage with only fair success, you will find that non-heading kale and collards are very easy to grow.

SEA KALE

The growing of a few rows of ordinary kale or collards may bring you in touch with sea kale. Sea kale, as a garden vegetable, is something else again. It is quite different from ordinary kale.

Ordinary kale is a member of the cabbage family; Sea kale (*Crambe maritima*) is a cultivated member of the Mustard family. It deserves to be better known.

The original plant, like the wild ancestor of the cabbage, is native to the sea coasts of western Europe. In its cultivated form, Sea kale is a perennial with large, cabbage like leaves—leaves that are often two feet long. If you decide to grow sea kale in your garden you will be in for a lot of surprises and an altogether delightful experience.

The seedlings are raised easily enough from seed in flats or cold frame much as you would raise cabbage plants. Raised from seed the plants require three or four years of growth before edible shoots can be gathered. A much quicker method of propagation is to use root cuttings planted in the Spring. In this way it is often possible to harvest a few shoots the following Spring.

The best way, perhaps, is to plant sea kale root cuttings much as rhubarb is planted and think of it in much the same way. The plants should be set out about four feet apart each way to one side of the garden where they will not be disturbed by the working of the regular garden. The large, rank-growing plants with their huge bluish-green leaves cover much garden space.

Naturally, you will understand that such a heavy growing, gross-feeding, plant will require large quantities of natural plant food and moisture. Again as with rhubarb, practically all the organic matter you can muster should be deeply dug in at planting time; compost humus for preference, but well-rotted manure—even raw manure—chicken manure, or even kitchen scraps, are better than nothing. Urging the plants into the maximum growth during the summer months—and how they can grow! is essential, for it is upon this uninterrupted growth that the size and quantity, even the quality, of the shoots which are to be gathered the following Spring, depends.

Somewhat as the shoots of asparagus are cut in the early Spring, so are the shoots of the sea kale harvested. Long before the leaves appear the shoots are above ground. When they appear, earth should be heaped over them, or boxes placed over them, anything which will totally exclude light. If an occasional inverted flower pot is used, the hole in the bottom should be tightly plugged. Unless light is totally excluded the shoots will be tough.

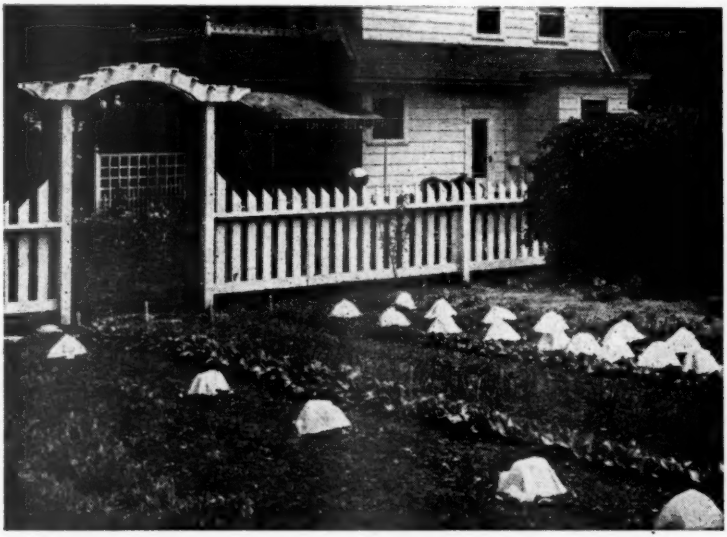
The shoots are ready for cutting when they are about a foot long. When the leaves appear cutting should be discontinued so that the plants may assume their normal growth. The earth used for blanching should be

leveled, all boxes removed, the area given clean cultivation. Weeds, of course, should be kept down. A mulching of rough compost humus will do much to save you a lot of hoeing, it will supply additional plant nutrients and conserve moisture.

Late in the Fall you will find it best to cut down and remove the foliage and to give the plants a protective mulching of straw or salt hay.

A lot of work? Sure, but a lot of fun, too. When you observe the huge sea kale plants, pick up a sprig of wild mustard and look at that also. Then think how strange it is that these two plants should be closely related.

Cooked like asparagus, the young blanched shoots of the sea kale, each a foot long and proportionately thick, are something to remember.



PREVIEW OF SPRING: HOTCAPS. By DR. L. L. DOLSON, Cedar Rapids, Iowa.

"You can start cabbage, tomato, cucumbers and melons two weeks earlier. Leave the caps on until plants fill all available space in them. This protects them against bugs and pests while they are most tender."

Make Gardening Easy With Cold Frames

MOVABLE COLD FRAMES

By EHRENFRIED E. PFEIFFER

COLD frames and greenhouses seem to many gardeners, particularly to the small and the home gardener, a thing for the professional or a symptom of luxury. With a proper system of rotating the frames over the garden they can become a very valuable asset wherever they are used. The problem of the small gardener is how to work efficiently if he cannot spend all his time in the garden. In a short working period everything should be achieved. Probably one person has to do everything including cultivation and weeding which require so much time.

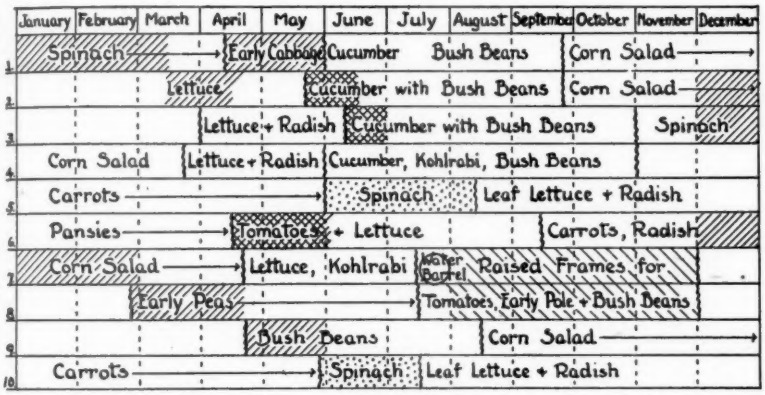
It has been our experience—wherever time is limited and little or no help available—that it is easier and more efficient to cultivate a small surface more intensively. This allows better preparation of the soil; more manure and compost can be applied per square unit, the control of weeds and pests can be more concentrated and become really effectful etc., etc.; many reasons why the intensively cultivated smaller garden is preferable.

Top production can be achieved, if movable frames rotate over the garden according to the crop one wants to stimulate. This system has nothing to do with the old style frame beds with heavy concrete walls and solid frames. These concrete cages are used for early vegetables and flowers and late in the fall. During summer they can be seen frequently filled with weeds. The soil, in spite of heavy manure dressing, increases in acidity and becomes gradually exhausted. Pests and above all fungus diseases on roots increase. After some years the earth has to be dug out and completely renewed or steam sterilized (not a very "organic" measure). The initial investment is high, the upkeep expensive, which, with the described troubles, leads frequently to abandoning the concrete boxes entirely and thereby doing much to discredit cold frame gardening.

All these disadvantages can be avoided with the movable frame system. In this case one erects a simple supporting construction (cf. sketch) with wooden boards on the sides and posts connected with a horizontal rod in the middle. The frames are put on this support and screwed down with two screws, one on either side, if necessary. This is a common system in Holland where they use a one-piece glass frame 3x6 ft. in size. In this country the individual frame is subdivided into 4 or 6, or even 8 pieces. The less sections the more light. The large section frames are just as resistant against storm, but where there is hail or snow it may be preferable to have the 4 or 6 section frames.

Now the main principal of the movable frame system is that the frames rotate from one bed to another according to the kind of crop just in growth. They are not stationary and therefore allow a much wider use throughout the entire year. Even in summer time they can be used,

sometimes for shadowing. This system is much more efficient and makes the initial investment pay off more easily since the expenses are distributed over a wider area and over a variety of crops. The smallest, very handy unit would be a double frame with four sash, two on either side, with a total cost of $20 to $25.—an expense every gardener can stand, especially since the increase of production pays for it right in the first year. The idea is to advance crops maybe two to four weeks toward spring and late fall, and to prolong the harvesting time. This way the growing season is prolonged about two months and, within the growing season, the growing time may be shortened by two to four weeks, thus allowing one to follow with more crops and have a more intensive use of the land.


January
February
March
April
May
June
July
August
September
October
November
December
1 Spinach → Early Cabbage Cucumber Bush Beans Corn Salad →
2 Lettuce Cucumber with Bush Beans Corn Salad →
3 Lettuce + Radish Cucumber with Bush Beans Spinach
4 Corn Salad Lettuce + Radish Cucumber, Kohlrabi, Bush Beans
5 Carrots → Spinach Leaf Lettuce + Radish
6 Pansies → Tomatoes + Lettuce Carrots, Radish
7 Corn Salad → Lettuce, Kohlrabi Water Barrel Raised Frames for
8 Early Peas → Tomatoes, Early Pole + Bush Beans
9 Bush Beans Corn Salad →
10 Carrots → Spinach Leaf Lettuce + Radish

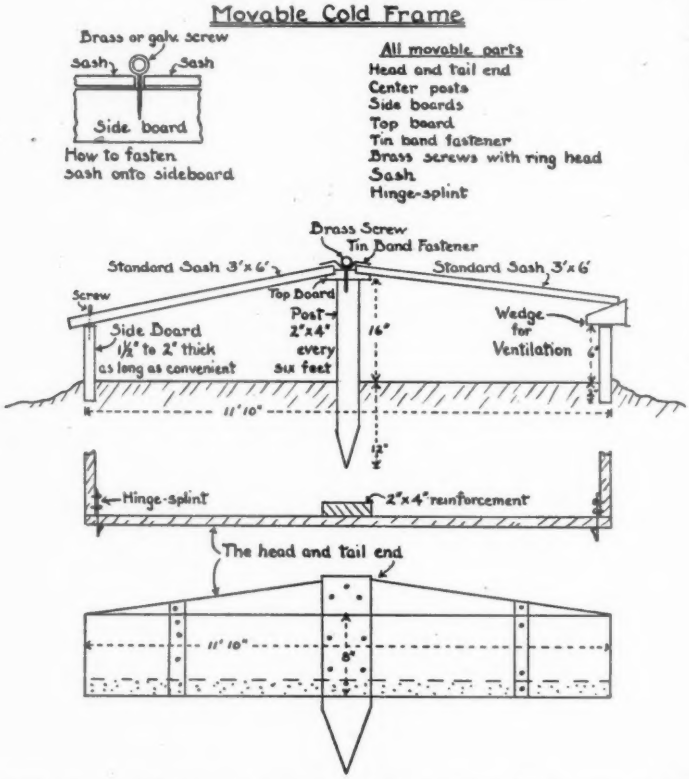
TIME SCHEDULE FOR THE MOVABLE COLD FRAME SYSTEM

The best time to prepare the movable frame system is late fall or winter. Select a garden spot which is level and with soil in good condition and well drained. This soil can be plowed, manured, harrowed or dug up before you put in the frame construction, or the construction can be put in first and all cultivation can be done afterwards. The width of the beds between the solid construction is just enough to let a Planet Jr. or a Roto-tiller go through. In order to do so the boards at the head and tail ends are removable. For land cultivation there is no problem at all.

Make yourself a plan as to rotation and planting. The plan, given here, is only a suggestion and can be altered according to your needs. This plan is for a climate of the latitude of New Jersey to Massachusetts; the farther South you go the more useful the cold frame may be during the entire winter. The idea is not so much to force vegetables as to protect and advance their growth. In spring the soil is warmed up underneath the glass, allowing an earlier sowing and quicker growth. If one crop is advanced enough to go along unprotected, the frame is moved to another bed in order to give an earlier start to another crop. So all crops can be advanced by earlier sowing, for it will be warm enough anyhow when the glass is removed. In winter time at least a small double section—two sashes on either side with the head and tail ends—can be used for field or corn lettuce—a sturdy plant, which grows even underneath the snow, and for hibernating sturdy plants.

Other garden beds may have had the benefit of the frost, but now we want to thaw them up and get them ready for the earliest seed and trans-

plants. It is wise to have the center posts and sideboards as well as head and tail ends planted before the frost begins, for we want to use all those beds during winter and earliest spring. Miss Evelyn Speiden, Chester, N. Y., observed last winter that lettuce, a bedding of straw or leaves is put to hinder the escape of warm air. But don't forget to remove the mats when the sun shines. What is most frequently forgotten with frames is ventilation. As long as there are growing plants, there should be ventilation



hibernated in a cold frame (part of the time covered with snow), started to grow again when the sash was put on the frame in March and the household had plenty of lettuce at the earliest date. Also witloof can be forced in cold frames late in the fall covered with leaves.

If one wants to keep the frames warm during the cold season loss of warmth must be avoided. As soon as the afternoon sun nears the horizon, the sash should be covered with a straw or reed mat. Against the side boards and head and tail ends during the warmer part of the day, (rain or shine!). Condensed moisture on the inside of the sash signals need of fresh air.

Plants build up their main bulk from the carbon dioxide of the air. How can they do it when the air is not renewed. Also excess heating-up during the day is harmful and causes weaklings. Plants growing in moderate cool air are much healthier. During the warm season plants need shelter and protection against burning heat rays. Besides whitewashing, straw mats can be used now during

the hot hours of the day—but never forget to keep the ventilation going, otherwise your plants will get a heat stroke and wilt quickly.

From the time-table for movable frames you can conclude the way of rotation. You may start with ten rows of beds or less. Besides corn lettuce, the earliest and hardiest spinach varieties can be grown during the cold season as long as the ground is not frozen solid. With the beds thawed up underneath the glass, early peas, radishes and carrots can be sown in late February, followed by lettuce and early cabbage or kale. Mustard greens and collards both very rich in vitamins should also be part of the earliest crops.

Once you get used to this principle you may find manifold possibilities according to your experience, desires and fancies. Also transplants of tomatoes and cabbage can be raised in advance.

In April when the snowy and chilly period is over, you can remove the sash from the first section and protect a new portion of land for the sowing of early cabbage, kohlrabi, a second set of peas, spinach and lettuce and the earliest beans as well as tomatoes. By the time these seeds have germinated and grown well, the danger of night frost is almost over.

Since we know that between May 10-15th there is almost always a cold spell, it is just as well to move the frames over the beds with the most tender plants as a protective measure.

In June the movable frames can be used to quicken the growth of cucumbers and peppers, interspaced with bush beans and kohlrabi (the latter do not well in heat and drought) and for shelter over spinach (cover at midday, open wide at night).

In July the shadowing will still go on—cucumbers, melons, peppers and beans—having the sash wide open for air.

In August all frames can be brought together and raised high for a temporary greenhouse in order to shelter and advance the maturing melons, cucumbers, tomatoes and to plant a last set of tomatoes and beans (bush and pole) for late fall. This "house" may stay until November. Besides growing plants it can also be used for maturing tomatoes (on shelves) which did not ripen outside anymore.

In the fall frames may be used too, on late spinach, radishes (try kohlrabi in September). It is understood that quick growing varieties will succeed best.

The land which is not covered by frames in the fall can be manured, plowed and made ready for the next year.

One mistake frequently made with cold frames is to overgrow plants. The proper thinning out in time, e. g. early, never late or too late, is very important. Since plants underneath glass get somewhat less light, they need more air and light space and suffer much when too crowded.

Now a word about the keeping of cold frames. They keep well for six to ten years and more if carefully handled and properly oiled (every year), or shellacked or painted (yearly or every other year). Breakage is much less if frames are stored vertically, the first one leaning against a wall but with enough air space for ventilation. They should not be stored horizontally one on top of the other. Just make it a custom never to have any unused frame lying flat anywhere. If stored vertically, small wedges can be inserted between each frame and the whole covered with tar paper in order to protect against weather and dust. Before being used they should be washed and, if necessary, painted and oiled before they are stored.

The whitewashing is done with a suspension of hydrated lime in water. To remove the whitewash again, one may scrape it off first, then wash with water. If the whitewash is very sticky, add some vinegar or technical (cheapest) hydrochloric acid to the water or sprinkle over the glass before

flushing off (avoid having the water run off into the garden beds).

In order to erect the summer houses, vertical poles are planted two feet inside the outer edge of the double bed and in the middle, the distance being that of the width of a frame. The height is so that the vertical frame, leaning against the outer row of poles, remains just one-half inch beneath the top of the pole.

The construction of the raised houses is in principle the same as for the low frames, only instead of side boards one uses high posts and leans the glass upright against them. The middle row of posts is higher so that there is enough pitch for the water to run off. These little "houses" are very practical and allow the maturing of melons or a very late crop of tomatoes. The construction material can be prepared in winter, dismantled again and used over and over again. If the poles (2 x 4), pointed on one end, are creosoted they will keep some time. (Do not use any wood preservative containing mercury). Use heavy galvanized, zinc or brass screws and nails—if not rusty they make dismantling easier.

At last, a word about fertilizing the soil in cold frames. Fresh manure should be avoided. The best results with the least diseases are obtained with well rotted compost and manure. Mineral fertilizer may become dangerous on account of the increased evaporation underneath glass—forming incrustation of salts on the surface, hardening the soil and prohibiting the circulation of air and moisture.

Proteins In Plants

SIR ALBERT HOWARD advanced the hypothesis that every disease of living beings, men, animals, and plants, was due to a deficiency in protein formation. He went so far as to suggest that so called virus diseases might be merely faulty protein synthesis. Protein is, as every farmer interested in cattle feeding knows, much connected with nitrogen. Give your soil a good dressing of animal manure, rich in nitrogen, and you get grasses with a higher protein content. We have lately published several items which proved that plants respond differently to different nitrogen fertilizers. The latest scientific contribution comes from the University of California, most active in methods of plant nutrition, and was published by J. P. Bennett under the title *Iron in Leaves*, in *Soil Science* 60,101. When leaves do not become green, likewise where variegated leaves have large whitish spots, and also when virus or organisms produce bleached leaves, the protein of these deficient parts is of a different constitution from protein in lusciously green leaves. (Incidentally, when iron was added, the soluble protein decreased in favor of insoluble protein.) In view of these findings, it would seem quite possible that we are at the threshold of scientifically explaining the success of the organic method. It appears not at all far-fetched to assume that the highly soluble nitrates of synthetic fertilizers produce a less balanced protein than the organic sources of nitrogen. This has not been investigated as yet, but every new discovery in this line tends to support Albert Howard's ingenious hypothesis.

Composting Town Wastes In India

From the annual reports of Dr. C. N. Acharya, F. I. C.
Nagpur, India.

LOOKING at population statistics of India, you will be surprised to learn that the general trend toward city living was just as pronounced in India as everywhere else in the world. Only nations with relatively stationary populations, such as France, have kept their city-country ratio at an even keel. From 1901 to 1941, India's population increased steadily from 294,000,000 to 389,000,000 or about 30 per cent. The population of the large cities more than doubled at the same time and if you count in all towns, from 2,000 inhabitants upward, the general trend is even more pronounced. In 1901, these towns and cities housed 68,000,000 people. In 1941, the same places housed 126,000,000. The towns and hamlets below 500 inhabitants lost during the same period no less than four times the population of greater New York.

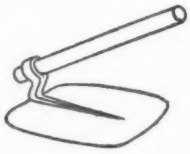
The waste products of such enormous masses of people are enormous, whether you include garbage and street sweepings, or merely consider what the British call "night soil". Dr. Acharya computed the manurial value of the urban wastes for all of India's towns and arrived at the following figures: 576,000 tons of nitrogen, 149,000 tons of phosphoric acid, 338,000 tons of potassium, and 752,000 tons of calcium. He quotes a statement made in 1895, because it still holds true in our day: "There is perhaps no more important subject in relation to agriculture than the proper disposal of night soil and other town refuse, for it may be said without exaggeration that *nearly one-half of the plant food extracted by food crops* from the soil is contained in the materials which are included under these two heads. It follows therefore, that on their disposal and return to the soil, depends the addition of a large proportion of the food necessary for the crops."

As everywhere in the world, so in India: The present disposal system aims at fulfilling sanitary requirements rather than at systematic utilization of the manurial value of the refuse. The author estimates that at present less than 10 per cent of the city refuse is returned to the soil as food for future crops. This is doubly serious in India, because under its tropical conditions the organic matter in the soil is rapidly destroyed. "A sufficient supply of organic matter is necessary in soils in order to keep the soil in good physical and biological condition, and thus to ensure healthy crop growth. Organic matter is of special importance in heavy clay soils, e. g., black cotton soils, in loose sandy loams, and also in the case of saline and alkaline soils. As vast areas in India belong to one or other of the above groups, the importance of adding to the land sufficient dosages of organic manures at regular intervals would become self-evident."

Since in India cattle dung is widely used as fuel, and since, as most everywhere, liquid manure is not carefully preserved at the source, the supply of farm yard manure for fertilizing purposes is insufficient to meet agricultural requirements. In view of this deficiency, the new source derived from city wastes becomes doubly significant. As a result, several methods of sewage and refuse disposal were instituted. The oldfashioned system which France first developed of letting human wastes dry out in trenches produces an unsatisfactory product, poudrette, which is low in

organic matter and smelly; besides it is alkaline in reaction and colloidal in nature, quick acting and highly unbalanced. As it is rich in nitrogen, it produces leafy growth, burns crops, and may lead to severe crop failures. The rawness of the malodorous material makes it disagreeable to handle, especially in India where purity laws and social systems are closely tied up with one another. As a result, members of a special class have to be hired to handle this substance. This in itself limits its usefulness.

As a result, the system of compost making came into existence. It is handicapped by two factors, especially the sanitation aspect, but also the municipalities' relative disregard for agricultural necessities. Just the same it is gaining ground. The rules set forth for composting centers were quite simple. They should be located on the side where the winds can carry the odors off, in India usually the East side, since West winds are the prevailing ones. Half a mile's distance is recommended since greater remoteness increases the cost of transporting the night soil. Trenches and tracks are laid out and dimensions for the number of population computed. Certain longhandled tools are shown as best suited. Then a



layer of *katchra,* road sweepings and garbage, is alternated with a quantity of night soil at the ratio 3 to 1. It can easily be seen that this corresponds with Sir Albert Howard's method of making Indore Compost—six inches of green matter and two inches of manure. The final layer is *katchra,* nine inches deep. "If the proper proportion is maintained, a man's legs should not sink in when walking over the compost mass at the end of the day."

The details, while applicable to similar structures elsewhere, need not be related here. Naturally, besides the trench system, an above-ground method of composting is possible. Testing for temperature, prevention of fly-breeding, and marketing the

finished product were further points to be considered. Under tropical conditions with rainy seasons certain problems may arise which would not occur elsewhere. But, as our readers know, the heat in the compost heap and the sealing action of the outside or top layer is so that all fly eggs and larvae are destroyed, if the heap is correctly made or the trench properly covered.

How far has this method of balanced sewage disposal taken hold since it was first introduced? There are already over four hundred municipalities which have trained workers, and over three hundred have gone into actual compost production. Considering the number of townships that *might* take up composting, these figures are not so greatly impressive, but when you analyse the amount of compost produced, the ledger shows up quite well. 270,000 tons of compost were prepared, of which four provinces account for over sixty per cent. In order to secure good distribution, the Government of India offered a subsidy based on the farmer's actual use of the material. This compares with similar subsidies granted to farmers in the United States toward the application of lime or phosphatic fertilizers. With the new facilities, it

is estimated that three times the previous amount should go into the fields during the current year.

The various government departments are collaborating to further this scheme. The Department of Information prepared a movie, entitled, *Need of the Moment*. The leading exhibitions displayed compost equipment, and other factors also came into play. "As a result of the intensive propaganda, it has been found possible to break down the prejudice which formerly existed among farmers in most parts of India against the handling and use of manure prepared from town refuse and night soil."

Now what is this manure worth? Naturally, the composts differed in various parts of the country, but the average content of organic matter was 20 per cent. The average nitrogen content was 1 per cent, while phosphoric acid was .9 per cent on an oven-dry basis. But here and there much higher figures were found, with nitrogen as high as 2 per cent.

It is interesting to note that health officers visiting the compost centers have after repeated inspections certified to the absence of any fly nuisance at the depots and to the marked improvement which the introduction of the Compost System has brought about in the sanitary aspect of refuse disposal. Naturally, the country's gain was also the gain of the cities in another respect. Instead of expending great sums to destroy or dispose of city refuse, the cities derive, from compost manufacturing, a source of income. Instead of unsanitary conditions prevailing around the towns, the inhabitants learn how to make a clean compost which does not spread diseases or disease-carrying insects.

When one recalls how many American cities, both South and North, have utterly inadequate methods of garbage and sewage disposal, this Indian scheme becomes doubly significant. The residents of many a big American city are constantly offended by burning dumps. Their smoke and smell drifts into the town and decreases not only real estate values in certain regions, but is an actual menace to the people's health. Their sewage is led into the streams and rivers, and the town below, which derives its public water supply from the same river, is forced to drink the sewage residues from above, as the city above drinks water polluted yet a little further up the river. True, the chemists attempt to clean the water and to destroy its bacterial life to make it drinkable, but at the same time, they cannot produce the same quality of clear fresh water that we might get in an unpolluted mountain stream.

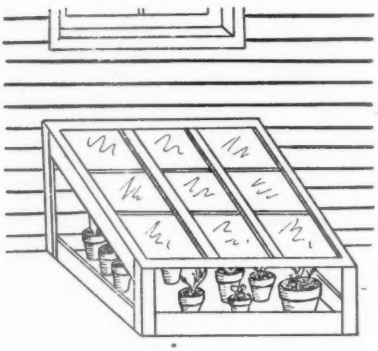
Just as important as the sanitary aspect (and, as mankind continues, it is steadily growing in importance) is the aspect of wasted plant nutriments.

Not so very long ago, there was a controversy in the columns of the *Houston* (Texas) *Post*, instituted by our subscriber Dr. L. W. Blau, well-know in geo-physics and oil circles as well as in the Texas Academy of Science. Dr. Blau said in effect that the time has passed when *disposal* was the problem. Now the time has come when we must learn to *preserve* organic substances and plant food so that our soils can keep on feeding the masses of population. J. I. Rodale wrote in a recent article that he was sure the world could avoid wars if everybody ate organic food. We might now add that if the present depletion of organic matter and plant food continued, the world would, in another hundred years drift into even greater self-destruction, because our impoverished soils would no longer produce the food needed for maintaining present populations.

England and India have made a start to reverse the course of wastefulness which was possible only during the period when imports from rich new countries could feed the growing millions of Europe and Asia. The time has arrived when such rich countries have ceased to exist. The

last two generations of farming have led to an incredible destruction of soil organic matter and all soil fertility everywhere in the world; yes, the time is already here when a leading American adviser to Presidents, Mr. Baruch, must warn against exporting our national resources. The time is come to look at composting as a means to restore fertility and to keep mankind going. If India is showing a way we might well take notice and adopt the system or adapt it to our needs. Dr. Acharya's reports were published by the Government of India Press in Delhi as *Bulletins of the Imperial Council of Agricultural Research,* and are well worth looking into. As the scheme progresses through the years, we hope to report about it in our magazine. E.

Gardening Devices



Sun-heated Greenhouse

Everybody is acquainted with cold frames and hot frames, but the sun-heated greenhouse is a relatively new discovery. A variation of a greenhouse as well as a coldframe is the lean-to arrangement shown in the picture. The sides as well as the top are of glass. The glass in the sides can be taken out in summer and the sash can be replaced by a screen. In winter, of course, the glass goes in and leaf mould or peat is packed around the sides to keep the warmth in. If the frame is placed against a cellar window the temperature can be kept more even by draining off the cold air, but then care must be taken that the moisture inside the sun-heated Lean-to does not go down below the requirements of the plants.

Interesting Letters Department

Dear Mr. Rodale:

Would it be too much to say—that the organic method, with its emphasis on Nature and the natural way, is not also a philosophy and points out a way of life? I find it hard to read any of the articles of Sir A. Howard without getting the impression that there are certain basic attitudes involved which go beyond the borders of plant and animal raising. No one can help but be aware of how much science and the machine have become such a part of our present-day way of living. If our clothes, our writing material, the very chair upon which we sit are by-products of science, it might be just as reasonable to argue that food-raising should follow suit. But Sir Albert never condemns the products of science, rather, he concentrates his criticism on the very uncritical and unscientific prejudices of mind which devotees of the scientific approach seem to possess. As a layman, I am only too aware of the magical fascination which the word 'science' generally conveys. In this respect we moderns are not so far removed from the ages when people believed in witchcraft and alchemy.

When, even in the matter of our plot of ground which we garden, science would wish to drown us with poison sprays and chemicals, is it any wonder that we jump at the first hand experience which Organics offers us? Here indeed, we become our own experimenters, studying that old original source to which even science owes its beginning—Nature. Might it not be true that the organic way, from this angle, is really the only truly scientific one? And, then, would it be too idealistic to hope that a natural way in doing would bring a natural way of thinking in which all of our 'scientific blessings' might become a part instead of becoming the whole of our thinking and existence?

Bingham Small.

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BEARING SEASON

I had a farm many years ago and in recent years have had a home garden. I have found that composting is invaluable. In one respect alone compost proves its worth, in that it prolongs the bearing season of such plants as tomatoes, peppers, lima beans, etc. My garden invariably bears such crops often a month later than my neighbor's around me, up to and sometimes past the first frost of the season and I can work my ground sooner in the Spring.

P. G., Wilmington, Del.

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MY RESULTS

Talk about organic gardening, here is an instance I tried in setting out A-1 tomato plants. I took a shovel and dug 41 square holes about 8" deep and put a large scoop of compost into each hole. I then set my tomato plants in the center of each hole pouring about a quart of Water Set Compost with each before piling the dirt around the plants. In two weeks these plants were 8" high and 6" wide having heavy stems and dark green leaves hanging near the ground. When I picked the tomatoes I got eight and

one half bushels of ripe tomatoes and still had over a bushel of green ones on the plants.

I also planted two rows of Butter Beans (Small Limas), without any compost, two weeks before I planted the other twelve rows. These twelve rows I opened up and put in four wheelbarrows of compost. From these twelve rows I picked six bushels of beans and from the two rows without compost I got a gallon and one half of beans.

So far I have two tons of compost, for next year, made from garbage, leaves and grass and will have three tons by clean out time.

F. J. T., Erwin, Tenn.

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CITY BRINGS LEAVES

The writer of this letter has been composting soil for a number of years and feels that he has good success with roses, iris, peonies and other flowers. I stumbled onto composting by myself by noticing how soon yard rakings, trash, etc., went into fine stuff that made the soil of better tilth. I now have the City of Boise trucks bring as many as 30 to 45 cubic yards of leaves to dump on a vacant lot in my block, which I let rot for two or three months and then spade them in my soil in generous quantities. I also use them for a mulch. I do not use anything except bone meal for my iris but use cow manure and bone meal for the roses.

My own observation has led me to believe that angle worms brought up soil from below and gradually darkened the soil on the top of the ground with their "castings".

H. E. Q., Boise, Idaho.

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COMPOST AND MULCH

We are rather new subscribers to your magazine and are very much interested in it. In your Nov. issue you have an article on rock mulches for fruit trees and mention a description of the method in a number previous to the time of our subscribing.

Would you be so kind as to tell us how the use of compost is combined with the rock mulch, and how the trees are fed from year to year? We expect to move to the Ozarks where there will be plenty of natural rock available. As we intend to set out a young orchard we thought the above method might prove very practical.

We intend to use composting and the organic treatment of the soil as, all unplanned for, we had a very practical illustration as to its value in our garden this summer. After my husband finished transplanting his tomato plants into the garden he had a few spindly plants left over that he put in the compost heap. The plants in the garden (not composted) nearly died from insects and disease while the plants in the compost pile only a few steps away didn't have a bug and were much sturdier. And we didn't use any spray or dust on them as we had to on the others.

Your idea of composting in the chicken droppings pit sounds very good to us, too. We expect to try that out on our farm also.

Mrs. H. A. S., Elgin, Ill.

EDITOR'S NOTE: It is best to apply the compost before mulching but in later years, it may be good to throw straw or compost on top of the stones so that the material will gradually sink in, as it would under natural conditions in a hedge row. This also will help in keeping down the weeds. When you make a chicken compost pit, arrange it so that you have access to it from the outside, which will save labor.

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"Am enjoying, as well as profiting by, reading Organic Gardening. You may realize how I prize it when I state that, because of failing sight, I limit my reading almost exclusively to this magazine, my Bible, and two or three religious magazines. I have, until the past two years, been a voluminous reader."

Eugene A. Spear,
Ventura, Cal.

Composting In the Olden Days

By OLIVER LAWRENCE

In this country the preparation of composts with stable manure and muck is an old practice, public accounts of the use of such mixtures dating back to the 18th century. Early Colonial farmers abandoned the fish to each hill of corn system of fertilizing when they discovered that by properly composting two loads of muck and one load of barn-yard manure they obtained a product the equivalent in fertilizing value of three loads of manure. By the middle of the 19th century this knowledge was thoroughly ingrained in Yankee agricultural philosophy, and Samuel W. Johnson, Professor of Analytical and Agricultural Chemistry at Yale College, asserted that "this fact should be painted in bold letters on every barn door in Connecticut."

White fish or Menhaden were abundant in Long Island Sound and many New England farmers found it economical to use fish as well as manure in their compost heaps. Stephen Hoyt and Sons, of New Canaan, Conn., made compost on a large scale, using 220,000 fish in one season. Ten or twelve loads of muck to one load of fish was their formula. A layer of muck one foot in thickness would be spread on the ground, then a layer of fish on top of that, a layer of muck, a layer of fish, and so on, topped off with a layer of muck, until the heap reached a height of five or six feet. This was periodically shoveled over until fermentation and disintegration of the fish (excepting the bones) had been completed. The resulting compost was free of odors and preserved perfectly all the manurial values of the fish. Land well manured with this would keep in heart and improve.

Professor Johnson, in 1856, had written some articles for "The Homestead" which proved to be so thought provoking and excited so much attention among readers of this journal that at the annual meeting of the Connecticut State Agricultural Society in January, 1857, he was invited to address that body on the subject of "Frauds in Commercial Manures."

It was then established that "gross deceits had actually been practised by parties soliciting the patronage of farmers in Connecticut, and the facilities for perpetrating further frauds were the subject of a lengthened exposition." A few years later, in 1859, Professor Johnson wrote a book (published by Brown and Gross, of Hartford, Conn.) entitled "Essays on Manure," in which, befitting its importance, the subject of composting received prominence and favorable comment. Composting was said to develop the inert fertilizing qualities of the muck itself, and a fermentation which began in the manure extended to and involved the muck, reducing the whole to the condition of well-rotted dung. *Muck* means in these old books all sorts of rich soil, even manure, but usually river bottom soil. It was pointed out that in this process of composting the muck effectively prevented the waste of ammonia or nitrogen.

Relatively small quantities of plant material were composted in these earlier years, as a sufficiency of barnyard manure characterized this motorless era. However, in some sections of the South, cotton-seed was composted with muck. The heap was started with six inches of muck, then

three inches of cotton-seed, more muck, more cotton-seed, and so on, finished off with a layer of muck. This was turned over, moistened and repiled once a month until complete decomposition of the cotton-seed had been effected. Considerable watering was a prime requisite.

As America grew older, many of the sons and daughters of the early New England settlers treked westward searching for more abundant and lower-priced land. Some of them found soil so rich in organic matter from buffalo droppings, plants, grasses and animals, all nicely composted into good earth by Nature, that little thought was given to composting—and "land-mining" was born. Only a few farsighted settlers in this newly discovered land of plenty continued the composting practices which their fathers had learned the value of while farming under more trying soil conditions.

From "A Philosophical Discourse of Earth," by John Evelyn, published in 1676: "Lands which are cold and dry are to be improved by contraries; namely, by application of composts, which are hot and moist." Evelyn observed that the use of a varied assortment of manures rather than a single type of manure established a better balance in the compost, and advocated the use of mud of ponds and stagnant waters of ditches, shoveled up and well aired before application to the heap. This mud was in especial favor for use around the roots of trees. And in watering the compost, it was suggested that wherever practicable water be used out of ponds where cattle drank and cooled themselves.

In 1796, Thomas B. Bailey, writing on the necessity and advantages of care and economy in collecting and preserving different substances for manure, invited attention to Saint John's injunction of Divine Wisdom: "Let NOTHING be wasted." Francis Blaikie, in 1818, in a treatise on the husbanding of farm-yard manure, stressed the importance of many kinds of manures in the composts (referred to as "pies") and the value of animal urine in these "pies." Arnold Eiloart, in an old book entitled: "No Plant Disease," cautions against the use of hot slops containing carbolic or other disinfectant soap, because germs would be killed or checked instead of multiplied in the compost. He favored what he described as the "earth method" (composting) for disposing of wastes, to secure health of plants and health of man. Parmentier, in "The Nature of Manures, and the manner in which they act," reflected that "the scarcity of manures, and their unskilful employment are the principal causes of the sterility of a country."

All of us have witnessed Nature at work in the forests composting plants, animals, leaves and other parts of trees which have fallen to the ground. Good man-made composting wells from the principles of Nature. Composting is but a return to the great crucible of Nature, out of which flows abundance. To feed the fields with compost is to nourish mankind. Composting is not new. It is deeply rooted in scientific agriculture—as old as Nature—older than Man.

Patents

PATENTS are granted on newly introduced plants, such as roses or carnations, only in the United States. Plant Patents are awarded only on sports or new seedlings, not on individual names. The plant must be new, not the name. The law has been in effect since 1930.

Over the Fence

by H. K. MEYER

MILDRED JENSEN LOOMIS and Ralph Borsodi printed an interesting item in their magazine *The Interpreter*, about the *Drift to the Country*. Before the War, the population of the small communities increased *twice as fast as the population of the big cities*, and even the rural farm population did not decrease as is generally thought but moved from 30,157,513 in 1930 to 30,216,188 in 1940.

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MR. GROSSMAN of the *American Friends Service Committee* visited the office and showed us pictures of *Penn-Craft*, a project sponsored by his committee in Fayette County, Pa. There the miners built in their spare time really professional-looking houses at an average cost of $2,000.00 for land and house. To all intents, these houses look like $5,000.00-houses elsewhere. Now the question of sound gardening methods arose and *Organic Gardening* came to their attention.

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J. I. RODALE'S *Pay Dirt* is making many new friends for *Organic Gardening*. Some readers of the book had never heard of our magazine and are delighted to find that such a medium of exchange exists. During the last ten months we received only three letters that showed dissatisfaction, but many hundreds of letters that proved we are on the right course. We try to balance every issue, a few articles on organics for garden and farm, compost methods, readers' experiences, etc., a few articles on vegetable and fruit growing, a few on flowers and wild plants, a discussion of general health aspects, and a few articles on nature and her ways. But of course, there is no magic formula, and composting takes hard work.

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MY OWN experience with "turning a heap" is this: I *pull the upper part down with a potato grubber or hoe*, similar to the instrument shown in the article on India. This works much better than a fork; then I draw the lower part over the half just pulled down. In this way, everything gets mixed well and the whole operation is completed in half an hour for my size of heap. The heap is thereby moved over and a new heap can be constructed on the old spot. By the time the new heap needs turning, the old heap can be used.

●

I'm becoming more and more partial to *Bone Meal* and *Hoof and Horn Meal* for my gardening purposes. So many other desirable products are hard to get when we need them, so many others seem too expensive for what they contain. Bone Meal, on the other hand, is a fine source for phosphorus and trace minerals, such as fluorine, while Hoof and Horn Meal is a very rich source of nitrogen. It

would take about fifteen bags of dried manure to get as much nitrogen as one bag of hoof and horn meal contains, yet the latter costs only five to six times as much as dried manure. On a farming scale, bagged organics are usually too costly, but for the gardener they are really the least expensive substitute to barn yard manure.

●

FORTY-EIGHT hours after a five-pound-an-acre dose of DDT was sprayed over a wooded area, Richard H. Pough, research associate of the Audubon Society, reported, *the woods were silenced* and all birds except hawks, hermit thrushes, and some towhees were believed killed. Dr. Annand of the Bureau of Entomology and Plant Quarantine, USDA, is reported to have stated: "Nature as we understand it is always out of balance and in need of our assistance." This just makes me smile.

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YOU CANNOT always substitute —some systems react differently from others, a matter which medical science acknowledges in general, but which it cannot apply in every special case. Even animals have different reactions, as H. L. Harris of the University of Minnesota reported in *Country Gentleman* some time ago. "Cod liver oil fed daily from birth to six months of age as a substitute for the butterfat in milk had no effect on the size or weight of Holstein calves in trials conducted over a period of three years at the Minnesota Experiment Station." Yes, but the Jerseys and Guernseys? They gained 17½ and 22¼ lbs. respectively more than calves which did not receive the oil. It was suggested that the Holsteins could draw more nutrition from alfalfa or needed less vitamin A. The fact that interests me is that *what is good for one living being may be unnecessary for another one.*

WHAT SIR ALBERT HOWARD has often denounced as "Fragmentation," the high specialization of research that loses sight of important matters of general concern, is gradually being attacked practically in this country. The New York State Experiment Station at Geneva has combined the divisions of bacteriology and chemistry under the name *Division of Food Science and Technology.*

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THE *National Lime Association of* Washington, D. C. states on the basis of a bulletin by the Pennsylvania Experiment Station, entitled *The Orchard Fertility Problem During the War Emergency*: "During 34 years of tests in apple orchards, legume sods kept under control by annual light harrowing or discing and by mowing, and annual legume covers worked down in the spring and immediately reseeded, have resulted in as satisfactory fruit crops *without the use of commercial nitrogen fertilizers* as non-legume sods or covers *with* added nitrogen. A similar use of annual legume covers in the peach orchard also proved desirable."

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A SCIENTIFIC analysis of DDT was brought out by Neeley Turner of the Connecticut Experiment Station in *Chronica Botanica* (IX,93). Some interesting points are: DDT not only does not kill mites, but the mite population *may rise* after application. A nice outlook if you have scales on your fruit trees. DDT was recovered from all parts of the body of mice, its effect is cumulative, and it is absorbable by the skin. If mice absorb it, naturally humans do too, as they spray it around. Let's see what happens when we have accumulated some in our brains!

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WHEN YOU order bulbs for spring planting, think of *Tritonia,* which we used to call *Montbretia* in years past.

I know of nothing more suitable to go in with your glads than these more slender, graceful, but reliable golden flowers. To me, a bed of gladioli lacks variation without the interspersing of these similar shaped, yet uniformly golden Tritonias. A musical piece is developed in several movements, all varying the same theme. A bed of glads and montbretiae is such a piece of music to the eyes. *Tritonia crocata* and *T. crocosmaeflora* are both good.

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A VERY interesting study by Z. I. Kertesz, entitled *The Chemical Composition of Maturing New York State Grapes,* appeared as *Technical Bulletin* No. 274 at the New York State Experiment Station in Geneva. Can the chemist determine the maturity of a grape by measuring its sugar and acidity ratios, its solids, etc.? The layman who is constantly bombarded by popular science writers with the miracles of research is sure that such a simple matter can be easily determined with "modern equipment", but the chemist tells us plainly "It can't be done". Why? Seasonal differences, differences of variety, and differences of location are much larger than those which occur between grapes which are not fully ripe and those which have attained full maturity. You can taste a grape in a given place at a given time and say: "It's ripe." But you cannot set up an objective standard that would suit different grapes and at the same time different localities for different years. There simply are two variables too many.

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I WAS turning over in my mind the books I read in 1945. Which of them did I enjoy most? Of older books that I re-read, the prize goes to J. Horace McFarland's and Robert Pyle's *How to Grow Roses,* (J. Horace McFarland Co., Harrisburg, Pa.) the classic that is now in its 19th printing. Of newer books I am wavering between Graham's *Natural Principles of Land Use* (Oxford University Press) and Clausen-Keck-Hiesey, *Experimental Studies on the Nature of Species* (Carnegie Institution of Washington), and in the fiction I'd pull with Mr. Barlow for Niggli's *Mexican Village* (University of North Carolina Press). But as I had made this tabulation, I thought of *Pleasant Valley, Pay Dirt,* and a couple more—and decided that 1945 was a year in which my knowledge of nature increased considerably. The older I grow, the more I turn to nature, especially plants.

"The Return"

A FEW minutes' sober reflection will blow sky high the arguments advanced by the Chemists in asserting that chemicals are necessary in the soil because an analysis reveals that vegetation is composed of Nitrogen, Phosphates and Potash. Well, the human body contains similar substances, but what sort of a man would a child develop into if he were fed on these chemicals only! Our natural food provides all that is required by us to build and maintain our body and strength. Likewise with vegetation; organic manure contains all that is necessary to plant life!—Reprinted from THE CROSS AND THE PLOUGH (England).

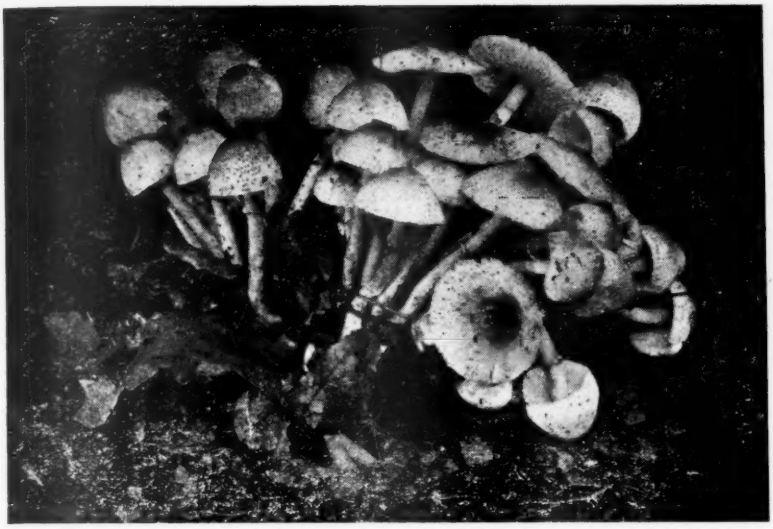
HONEY MUSHROOM N. Y. Botanical Garden

What Is a Toadstool?

By G. L. WITTROCK

PERHAPS the most common question asked about a mushroom is "How does a mushroom differ from a toadstool?" To most people a toadstool suggests something objectionable, something to be avoided, a name readily applied by most people to wild mushrooms that they see and meet with in their walks in the woods and see on dead trees, or through fields, or even on lawns. To the amateur's eye these fungoid growths are recognized and condemned as poisonous and called "Toadstools" with contempt, even though in most cases, their identification of the fungus is wrong: it may be a delicious morsel of excellent food. The more grotesque the shape of the fungus growth, the more deadly it must be, concludes the layman and naturally this loathsome toadstool must be avoided. Paradoxical as it may seem, the most dangerous mushroom, the deadly Amanita or Fly Agaric, is a beautiful, symmetrically shaped mushroom with its clean white head held high by a stout stem; it is this appealing shape and form that attracts some people to pick it for food since it appears so appetizing and reveals or suggests nothing of its deadly poisonous character.

Are all fungi poisonous and if not how can one segregate the edible forms from the poisonous? Mushrooms are classified by their spore producing structures such as the Disc or Cup Fungi where the spores are developed externally on a disc or cup-shaped organ; Polypores or Pore Fungi, where the spores are developed on the inner surface of minute pores

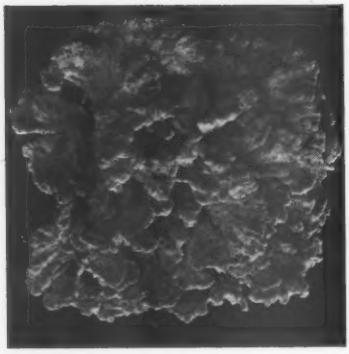


PARASOL N. Y. Botanical Garden

easily observed on the underside of the fungus; Gill fungi in which the spores are produced on plates radiating from the stalk or stem to the edge of the cap, suggesting gills of a fish when the underside of the cap is observed; and finally, the Puffball Fungi in which the fungus body is a solid structure suggesting usually a globular mass in shape and when mature the entire top of the fungus disintegrates into spores and some forms actually "puff" out spores when slightly pressed. Most of the edible forms are the Gill fungi while all the Puffball types are edible. One authority on the subject recently stated that many tests are suggested by the amateur, but none of them are dependable in separating the edible forms from the poisonous. He condemns the silver spoon or coin test which is supposed to turn black in the presence of a poisonous mushroom; also the test of putting salt in the gills of the fungi to note whether they turn yellow is absolutely worthless; and if onions cooked with the mushrooms turns the mass black, do not throw them out because this happens with good mushrooms too. He concludes that all mechanical devices and tests are "worthless and, worse, may even lead to serious consequences if relied upon".

There are about 600 species of mushrooms in the United States of which about 20 are poisonous. The safe ones to learn are the Pufffalls, Brick Top Mushrooms, Oyster Mushroom, Abortive Earth Prune, Honey Mushroom, Inky Caps, and the Sulphur Mushroom. However, all authorities emphasize that the fungus to be eaten must be learned as one learns to recognize a rose from a geranium. Fungi do have distinguishing characters easily identified if you are interested.

Of all the gill mushrooms to which the common market variety belongs, there is one diagnostic character that can be learned, thus segregating the poisonous from the edible. Take a piece of unglazed black paper such as tar or the wrapping paper of photograph print paper and place on it the severed cap or head of a gill fungus you wish to test. On the sides of the gills, spores develop which are colored from white, cream, yellow, red, purple, to black, depending on the species. One average mushroom-head may



CHICKEN MUSHROOM
N. Y. Botanical Garden

produce from 2 to 7 billion spores. After a few hours, spores will drop from the cap of the fungus onto the black paper; if the color of the spores is other than white, the fungus is a mushroom and thus edible. In other words, fungi with their spores colored from cream to black are edible; it is the white spored species that must be learned since 5% of this group are poisonous. There is one colored spored species that may be found in this part of the world that is poisonous; but the fungus is so minute and so rare in this part of the country that we can exclude the exception. The deadly Amanita is white spored while the market mushroom is pink spored. The Inky Caps are interesting because of their black spores, yet this objectionable color should not exclude the species as a food, since they have the richest and strongest mushroom flavor of all the edible forms.

A toadstool in Europe was, in former days, associated with surprising superstitions. Though Europeans called them toadstools, they admitted in many records that toads do not "sit on the Stools" nor do toads seem to have anything to do with the fungus. But they feared the fungoid growth and they always kicked the toadstools to pieces, especially if they were found growing in large rings or "Pixie rings" as they were called by the peasantry. They explained that the toadstools sheltered elves under them. If an elf peers at you from under the toadstool head, better get some quinine and take it, for you are sure to come down with a fever, was the general warning of the day. And farmers were also warned that if a cow were looked at by one of these imps, she would become bewitched and thus would give sour milk, or worse, she would get the urge to dance and actually turn somersaults. They added that toadstools always spring up in the footsteps of the "sprites" as they dance; and the tops of the toadstool served as tables to the fairies; cup fungi, which suggest miniature nests with eggs were called "Fairy Purses".

Most Indian tribes in the United States feared fungi, and with but a few exceptions, never used them as food. Prairie tribes were taught to eat them by the white man. One authority records how difficult it was to introduce a mushroom as food to the Indians; the brave Indians at first, looked on with horror as the white man prepared a dish of them. This fear of fungi can easily be appreciated when one observes the Hopi Indians who call them "Round Fossils". They say that the fungi represent cancer and thus must be avoided; to touch one, they warn, would transfer the malignant growth to the body. Some tribes used them in medicine, using the top of the mushroom as a

MOREL N. Y. Botanical Garden

poultice for toothache, or placing a bit of it in a decayed tooth. It is said to be so strong by the Indian Medicine Men, that a piece of the cap in a tooth cavity sometimes kills and draws out the aching nerve. Another form of painkiller was to take a piece of "Spunk", the general Indian name for all perennial fungi, ignite it and burn a small place with it behind the ear, particularly on a vein; they say that one will never have a toothache again on that side of the head. Mexican Indians used various herbs and roots to make a beverage to which a kind of mushroom was added to serve them as a form of narcotic that gave the user lurid visions. It is interesting to realize that Eskimos of the north ate mushrooms.

If you do not like mushrooms, at least drop the name "Toadstool". All mushrooms, whether poisonous or edible are of absolute necessity in the cycle of life on this earth. Fungi, which include mushrooms, molds, yeasts, etc. break down animal and plant tissue in the process of "Rotting" and reconvert this dead material into organic compounds that make rich organic soil to be used again in the complex process of life. If it were not for this function of fungi, living matter as we understand it would soon disappear on this planet. Remember, one of the major factors of a compost pile is the fungi within it that are processing the dead organic matter for reconversion into soil fertility.

INKY CAP

N. Y. Botanical Garden

How Far Do Roots Reach?

MOST gardeners believe that most of the roots are in the upper foot of top soil. They have often enough pulled out a lettuce gone to seed, a carrot or a beet. But when you look for the entire root system, how far down would you have to go before you reach the last root tip?

Make a guess, and we wager that you will underestimate the capacity of most plants. A beet, at the eating stage, reaches down—ten feet and over. Spinach, after six weeks, just ready to go into the pan, has already sunk its roots three feet deep. When your lettuce begins to bolt, its root system has a length of eight feet. And if you have wondered why it is not easy to grow a successful crop in a spot on which a rhubarb plant has feasted for a number of years, you need only inspect the rhubarb's root system—it has gone ten feet below ground.

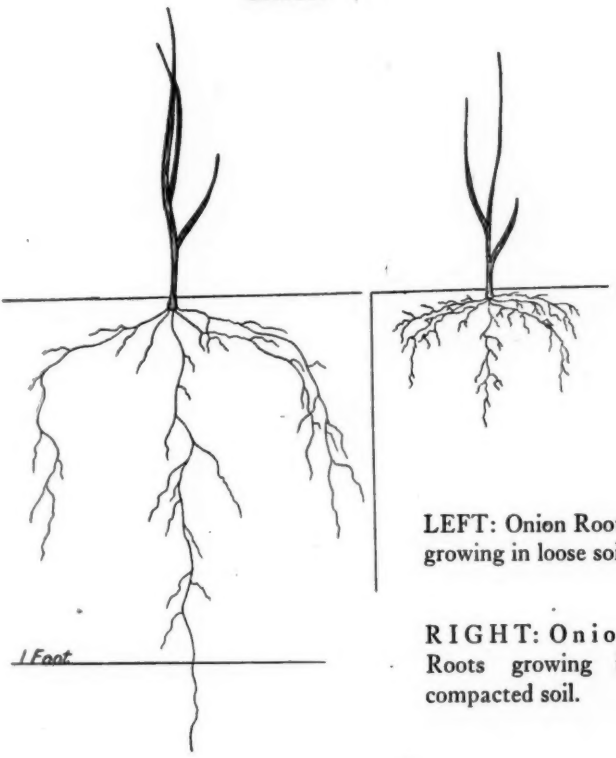
This, of course, is only half the story. There also is the lateral spread, more important yet to the gardener. Everyone spaces his vine crops rather widely, because cucumbers, melons, and even squash take up much space on the ground. But they take up even more below the surface. A cucumber will spread nine feet in all directions and a squash takes in an area of 28 feet square when it is just eleven weeks old. It is still growing and its main roots gain two and a half inches a day. If you wanted to give each lima bean full sway, if you did not know that the fine roots can intermingle, you would have to leave it not less than seven feet. Lettuce should have three feet, tomatoes five to themselves. And you will be surprised to learn that a carrot not only reaches the depth of eight feet, but also spreads a total of five feet. You will doubt this. But assume you spend twenty years on investigating root systems, you hire a staff of workers who can dig the fourteen foot trenches through heavy clay soil, through sandy loam, and then go down and lay loose the roots with ice pick and water hose. Assume you do this in different states with different soils. Assume that you get the funds to carry on with this program until all these roots are drawn and described by draftsmen and botanists interested only in the facts, not in any sensational discovery. If then you should find that a horseradish reaches down below fourteen feet, that even the quick growing pepper takes up three cubic yards of space, would you still doubt the fact?

How little we know about roots is apparent enough when we make these startling investigations and even more startling discoveries. What would you say if you had all this information and nobody could get a hold of it? Is the work of decades, the tens of thousands of dollars spent on these researches not worth communicating to others? John E. Weaver and William E. Bruner of the University of Nebraska thought it important and wrote a book, profusely illustrated with carefully drawn graphs. The pictures had to be drawn on a large scale, as the camera would not be accurate enough, it would blur the thousands and millions of little roots. This work was published in 1927 and has long been out of print. Its main facts and all cultural advice of immediate practical use are now again available in a booklet just published by us. The reveal-

ing illustrations were carefully redrawn for our booklet and a comparative table was added to allow the gardener, almost at one glance, to determine how deep and how far the various vegetable roots reach.

Take just one look at the two reproductions of onion and lettuce plants grown in loose and in compacted soil. By these pictures the plants themselves tell us quite clearly how they can grow if the soil is loosened up. Some people think plowing is a folly. We know that loosening the soil is essential for good root development. Whatever instrument helps in loosening the soil, be it plow or harrow, disk, or subsoiler, is helpful to the plants. There is another aspect involved: Let a dry period arrive, let the compact plant on the compact soil forage for moisture! It will not succeed while the plant with the extended root system can still tap the reservoir in the lower soil strata. Under favorable conditions, the plants with the smaller root system may, of course, be even better developed, as everyone knows from his carrots, salsify, and other root crops. Sometimes we do not want deep roots, we want compact growth.—But whatever questions we may put to the scientists, their reports and their pictures give us revealing answers. It is, indeed, a satisfaction that the original publish-

ONION



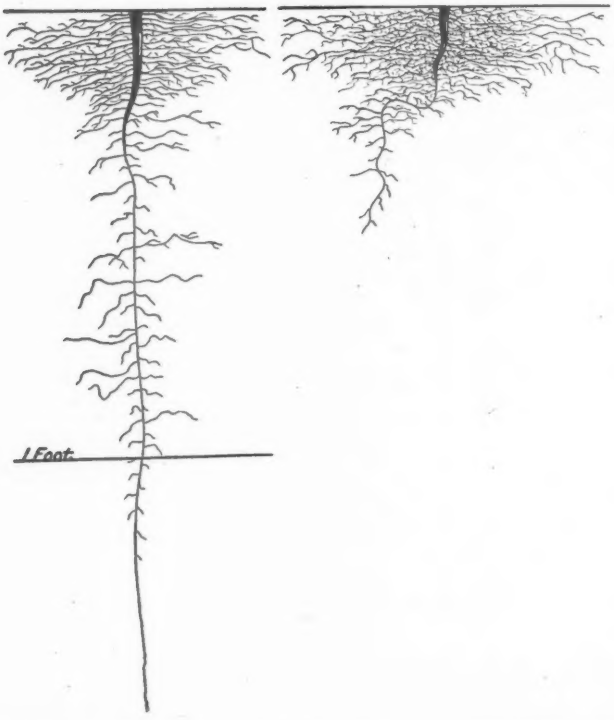
LEFT: Onion Roots growing in loose soil.

RIGHT: Onion Roots growing in compacted soil.

ers, McGraw-Hill Book Company, New York City, made this reprint possible and it is a great satisfaction to ORGANIC GARDENING that we can bring this rich treasure-house of plant and garden information to many new gardeners.

See our advertisement on the last page.

LETTUCE



Manure or Artificials?

IN the book SOIL CONDITIONS AND PLANT GROWTH by E. Russel, the author said: "There is no doubt that the plant can grow satisfactorily and attain full development with inorganic nutrients only. But numerous field observations suggest that in the soil some of the organic matter may play a direct part. No combination of artificial fertilizers is as effective as farm yard manure in maintaining a high uniform level of crop production from year to year." Russel's book had its fifth edition in 1927 and was published in London.

Poisonous Plants

By ROBERT O. BARLOW

2. Belladonna

BEAUTIFUL LADY—what a name for a poisonous plant! During the Renaissance when the Italian cities were the leading business centers of the world and when luxurious ladies wanted to increase their beauty, their druggists and herb women supplied them with an extract of the deadly nightshade. This they dropped into their eyes and their pupils became dilated. Nowadays, the ophthalmologist does the same when he wants to see into your eye. The eye is, after all, the only part of our body which can be looked into and the ophthalmologist is the only physician who treads absolutely clear ground. A drop of *atropin* is placed in your eye. Why is that pupil-dilating agent called thus?

There are three old women in ancient mythology, called the Three Fates, and one of them is Atropos, the nasty one who cuts our thread of life. When Carl Linnaeus had to name his plants, he thought of the nastiest plant and called her *Atropa belladonna.* It's the one which has caused the death of many unwary children picking berries in the woods, the one that drove the witches to their nightly rides on broomsticks, the one that helped debtors to get rid of creditors, lovers to get rid of rivals, and faithless husbands to destroy loving wives, one of the most dangerous poisons, one of the most useful drugs. Atropin is made from it.

It is not even now fully decided how many closely related and as yet undistinguishable agents are contained in the roots, leaves, and berries, most particularly however the seeds of the Belladonna. Four such agents called Isomeres have been established and if you like formulae, here is the one given for Atropin: C 17 H 23 NO 3. Both in the growing plant and in the laboratory, changes occur and one substance turns into the other. But however complicated chemistry may be, these substances, called alkaloids, are invariably deadly when they derive from Belladonna.

There is a great number of nightshades that are not poisonous, but you can imagine how the old people must have looked askance at the first potatoes, their flowers looking like nightshade flowers, their seed balls looking rather much like nightshade berries. No wonder, they stuck to oats, millet, and rye and had to be practically forced to grow and eat potatoes. Of late, we have seen catalogues advertising a "garden huckleberry", which is nothing but a cousin of our deadly nightshade, the black nightshade, often called poison berry. The berries are said to lose their poisonous quality when put in a pie, but this is a plant from which I should shy away, even if it were sold as a wonder berry. I had rather not wonder afterward.

Atropin is a nerve poison that has the specific power of affecting nerves controlling our involuntary muscles, especially the muscles of the eye. In cases of severe cramps, in cases of morphine poisoning, also in certain cases of digestive trouble, atropin has been administered with success, but as a rule we now use other medicines. If you had a bottle of belladonna tincture around and put a drop of the pleasantly colored purple stuff in a glass of water, just to have a taste, you would recognize a certain proximity to the taste of the blueberry or

huckleberry, but then you had better stop. For if you take a few drops more, your throat will start getting dry and your pupils will become dilated. You will become a bit silly and act like picking up stones, and if you had one drop too many, you might be picked up yourself and laid at rest.

BELLADONNA

Detective story writers who want a good poison had best pass over the tinctures of belladonna or the compounds, such as atropin, because the symptoms are so obvious that it would not take a famous sleuth to decide that foul play has been enacted. The strangled feeling in the throat, the dry feeling in the back of your mouth is very noticeable, and the smallest amount of the poison may affect you that way. It is said by folklorists that the Slovaks used to collect many a hundred-weight of belladonna roots in their woods to spike their liquors, but I have slight doubts about it, since the poison is not any less effective when taken in alcoholic form.

The corm of the plant is quite rich in poison, but as far as the plant is concerned, all these carbon, hydrogen, and nitrogen atoms are good food. As a result it requires the plant not more than a few weeks in spring to shoot up three or four feet; fortunately, the plant occurs much more frequently in Europe and Asia than in America where it is not a native. Out of every leaf axil arise flowers, usually of a brownish red color which are surrounded by a large green cup of leaves on which before long the cherry-like black berries are offered to the unwary traveler. Death may result in from three to fifteen hours unless countermeasures have been taken, of which the stomach pump is the safest.

The Pharmacopoeia of the United States names a considerable number of Belladonna preparations, which are made from leaves as well as roots, but not from the seeds. One of these preparations is a plaster. It is rarely used and for good reasons. For there were cases of sensitive people who were endangered by the entry of atropin into their systems through a lesion in the skin.

And then you look about in nature and find that sparrows and thrushes and blackbirds eat these poison berries with delight without being the least bit affected. They only help in spreading the seed over a wider territory, but it would be a bit farfetched to assume that there is a special adaptation. It would be interesting to know how many different animals are impervious to poisons that would kill a man. If we knew more about bodily behavior and biological reactions of other living beings, we might learn more about our own.

3. Henbane

Hyoscyamus niger was the name Linne gave to the black henbane. It is more common in the Northeast than the deadly nightshade, though it too was imported from Europe. While the nightshade loves cool woods, henbane grows near trash piles and along roads and in other waste places near human habitations. This plant is a biennial. During the first year a pretty rosette of leaves forms on the ground, which

during the second year produces the flower stalk. The nicely purple-veined flowers are small, sitting in the leaf axils, and have a yellow color. You almost could guess that they are poisonous by looking at them. Suppose a plant produces fifty fruits, which may be the average, would you also

HENBANE

suppose that these contain approximately ten thousand seeds? Yet, one plant was observed which contained almost three thousand fruits with almost a million seeds. It is a wonder that the world is not covered with henbane.

The official drug is the dried leaf of the plant, with or without the tops, but not the root, though the latter is especially rich in the poison Hyoscyamin, which we know already as an isomer of Atropin. Even old Dioscorides of the Greeks knew that the leaves lose their power after some time, and the same is true of the belladonna leaves. The medicinal property of hyoscyamin differs from that of atropin or belladonna in that it acts more gently and more as a sedative on the nervous and muscular systems. Maybe, it was for this reason that the medieval brewers had to be warned not to add the substance to their beer. The fact is that off and on people die from it or suffer serious poisoning. One such case occurred at the scene of Thomas Mann's Magic Mountain in Davos, Switzerland, in 1910. Somebody sold henbane root to a hotel and called it salsify. Twenty-five guests became sick, but they all survived. You just wonder if some herb collector had it in for one of the visiting sick.

4. Jimson Weed

The plant physiologists have taken great pains in playing with chromosome behavior under the influence of one poison, derived from the fall-flowering crocus; they applied this poison, colchizine, to tomatoes, as well as other cousins of the potato, especially the Jimson weed, which some also call Jamestown Lily, and which has the scientific name of *Datura Stramonium.* The effect of its alkaloid is similar to that of henbane, but Jimson weed appears to be a native of America. Some say that it was imported from the tropics of Asia. The Gypsies were blamed for bringing it to Europe and Datura is definitely an Indian name. Stramonium is used medicinally in extract and tincture form, and the basis for it are the leaves and flowering stalks of the plant. The seeds may contain ten times as much of the poisonous alkaloids as the leaves, the flowers usually have more than the leaves, and the seedlings more than grown plants. But cultivated plants have been found to differ from wild plants in that they contained mainly hyosciamin, the agent of henbane. But as said before, it is not easy, if at all possible, for even the best chemists to know definitely what agents these plants contain, because in the process of extraction one compound is apt to change over into the other, and how should one know then what was originally there? It almost is like Einstein's theory about time and space.

I am amazed at the instinctive knowledge of those old herbalists that go under the name of witches. What in the world could have caused a medieval witch to make a brew or a salve consisting of Belladonna, Jimson Weed, Henbane, and of all things Mandrake? And yet, this is what they did, though science had to wait until well into the enlightened 19th century to find out that mandrake contains an agent that is identical or similar enough to the alkaloids of the other three. Applied as a salve, these alkaloids would not easily cause death, yet would drug the willing victims into a stupor laden with joyous dreams of flying through the air, having pleasant meetings with grandfather Devil on top of a mountain, and partaking of glorious feasts and carousings. So vivid were those dreams that the deluded old women thought they had actually been through these joys, for which, if found out, they were usually burnt or, if it happened in New England, hanged.

In speaking of poisonous plants we simply cannot get away from the origin of all evil, the devil, and his mates, the witches. If you want to learn about ancient witches, there are many good sources which at one time or another we shall cite, but if you seek information on modern witches, I recommend that you get the most excellent book by Niggli, entitled *Mexican Village* and published by the University of North Carolina Press, Chapel Hill, N. C. This is a novel and at the same time a report of a village, but each chapter is a well-balanced short story, which you can enjoy even more when you forget about the Eagle witches that are occasionally brought into the picture as a matter of course. And if you like your pipe, think of it that tobacco too is a relative of henbane and Jimson weed, just as potato and petunia.

JIMSON WEED

Reader's Correspondence

Send stamped self-addressed envelope for reply.

BEET WASTES

Q. In what combination with other materials, and how, should beet-seed waste be used in compost making? This waste from a beet-seed cleaning plant, at present consists of defective seed, pieces of stems, etc.; later the seed is screened more effectively for planting; so the waste would be more concentrated.

M. W. R., St. George, Utah.

A. Use the beet seed waste as part of the green matter in your compost heap, but be sure to add sufficient nitrogenous material, preferably fresh stable manure, or if unavailable, commercial chicken manure, dried blood or hoof and horn meal. If the heap is built in one operation, according to our specifications, it will heat up and the seeds will decay and form very good fertilizing material.

—o—

BACK YARD COMPOST

Q. I am interested in the making of compost, but have only a city back yard garden. I can never have a large compost pile but I do want to turn my garden waste, kitchen parings, lawn clippings and all organic waste into organic manure?

H. G. M., Flint, Mich.

A. For those who have a small garden and no room to make compost, the best method is to dig in such materials as dried blood and bone meal, which can be purchased from fertilizer dealers. It would then be advisable also to dig under each year such things as grass clippings, etc.; thus the soil would get animal as well as plant matter.

DOLOMITE

Q. Where can one buy Dolomite, and of what particular value is it? What kinds of soils are lacking in the elements it supplies?

I. S., Carroll, Iowa.

It is easy to buy dolomite if you ask for it in the seed or fertilizer stores or even factories. The product of the American Limestone Co., Knoxville, Tenn., called *Mascot* or of the Woodville Lime Product Co., Toledo, Ohio, called *Tenlime,* can easily be secured.

It is our custom to use different materials in the compost heap; after the first layer, a sprinkling of lime or dolomite, after the second, a sprinkling of ground phosphate rock and after the third, a sprinkling of oyster shell flour, etc. Where you use lime only, you assume, of course, that there is no magnesium deficiency. Where there is a magnesium deficiency, we should always advise the use of a dolomitic limestone.

—o—

HOW TO START A GARDEN?

Q. I wonder if you could clear up a few elementary gardening points for me? When spading a garden should the clods be turned over and broken up, or should they be put back in their original position and pulverized? I was thinking of the position of the top soil.

Also in regard to the application of compost, is it better to place it directly in the rows to be seeded the first time rather than over the entire plot? I was wondering whether the plants would obtain nourishment from the blank spaces between rows?

H. G., Chicago, Ill.

A. By all means, turn over the clods in spading. This serves several purposes. First, it allows you to increase the amount of your top soil by digging a little deeper everywhere. Second, it brings up the root residues from below and enriches the organic content on top. When these rootlets break down, they release nutrients which filter down to feed the next crop. Third, Nitrogen, the most important plant food, has a tendency to seep downward with the water. By spreading and turning, you will bring it back to the top. Fourth, the mineral elements in the soil are brought up to the top where they will be broken down through the action of water, air and especially freezing so that more nutrients become available to growing plants. Five, by turning and at the same time breaking up the more compact soil from below, you expose the soil to the air and stimulate the action of bacteria, thus enriching the life in your soil.

If the clod is not crumbly enough as you turn it over, give it a dig with the sharp side of the spade to break it up, but leave the bed in the rough through the winter. This will store moisture and prevent baking of the soil. In spring, smooth the surface.

There are several methods of applying compost. I prefer the following: I bring the compost on the bed in piles and spade it in the row as I dig. This produces more even distribution and also makes digging simpler because you do not constantly step on the compost material. I should advise that you do not take too much earth on your spade. Four inches is a good measure. It is better also because you will have fewer clods. At the same time, it enables you to divide your compost more evenly over the whole bed. Our forthcoming booklet on roots will show you how roots spread in the ground and it is better to supply them uniformly rather than putting the compost in a band or a row. You need not worry about your first garden. If the soil is good and if you choose the proper crops at the right time, you will succeed.

—o—

HOME MIXING

Q. What is the content of phosphoric acid, available nitrogen and

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potassium in dry sheep manure, dry cow manure?

I want to use organic fertilizer 5:10:5 by mixing dry sheep manure and bone meal, containing 22% of phosphoric acid. Having got your information on item 1, I shall determine proportion of dry sheep manure and bone meal. However, the mixture will be poor in potassium. How to increase potassium in organic way?

To make complete fertilizer many minerals, some in minute quantities should be added. Compost can do it. However, if leaves and grass, which I use for compost grow on soil deficient in some necessary minerals, compost may be lacking in them.

How to add to the mixture these minerals? I suppose that even inorganic minerals would be good because added quantities are minute. However I have not found on the market such a mineral fertilizer.

I. R., New York City.

A. Your letter is so important that we want to give it a more detailed answer. Dried sheep manure has from 1.5 to 3% nitrogen, from 1 to 2.5% phosphoric acid and from 0.3 to 2% potash. Dry poultry manure has a much higher nitrogen content and would be by all means better for mixing in the way you suggest. Cow manure is still lower than sheep manure and would not work out well. I should personally suggest that you use either cottonseed meal or dried blood as a source for nitrogen or, if you can get it, hoof and horn meal. The nitrogen content of dried blood and cottonseed meal is usually in the neighborhood of 6% while hoof and horn meal may be as high as 20%.

Phosphoric acid, you had best supply in form of bone meal, which analyzes from 20 to 25%; whereas potassium and the trace minerals can be easily obtained from the green matter.

It is true that a depleted soil produces poor growth. At the same time, the plants are mineral gatherers and contain potassium and trace minerals in much greater condensation than

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the surrounding soil. If that material is, therefore, composted, you will get considerable amounts of necessary plant food and should have no trouble with your garden.

—o—

FRUIT SEEDS

Q. Are the kernels of peach and prune stones good to eat?

M. W. P., Providence, R. I.

A. All fruit seeds, especially peach and plum, contain amygdaline, which, if taken in quantity, is a poison, since it acts on the blood corpuscles and nerves producing what is called cyanosis. However, small amounts are not apt to be dangerous and can always be eaten. Apple seeds, pear seeds, sweet almonds, citrus fruit have no dangerous amounts and are recommended; but bitter almonds must not be eaten in quantity since they have great amounts of this substance.

—o—

NURSERIES

Q. Would like a list of the best dwarf fruit trees. If they are listed in your *Fruit Orchard,* please send it.

L. W. S., Floral Park, L. I., N. Y.

A. Since our readers are pretty evenly distributed all over the country we had to forego the temptation and leave out the lists of suitable trees, because "the best" in trees depends much on the place where they are grown. Some have to be hardier and some must be otherwise adapted to the region where they are to be planted.

We should advise you to order your trees from a reliable nursery. We should advise that you order in fall whether you intend to plant then or only in spring because spring delivered trees are picked and dug in fall anyhow. You may follow the custom of your community, but we think that in Long Island spring planting is just as sound as fall planting, though the

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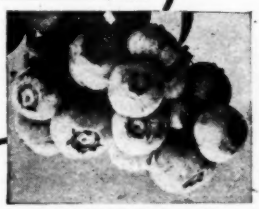

HYBRID BLUEBERRIES

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latter may be a bit preferable. We here planted in spring and every tree succeeded though the spring was exceptionally early.

Dwarf trees are a matter of trust; you cannot determine what you are getting and you simply have to rely on the nurseryman's reputation. Except for apples and pears, dwarf trees are really not so essential; but in apples all depends on the right root stock (Malling type) and the proper budding. You want to be sure that the budded place stays above ground as it was in the nursery.

—o—

BLUEBERRIES

Q. Will you kindly tell me the culture you recommend for blueberries. Since they require an acid soil, the procedure in this locality is to use sulphur or sulphate of aluminum to turn the soil acid and fertilize with Stadler's Garden-Gro.

My blueberries are planted in heavy clay soil to which I added a generous quantity of acid peat when preparing the soil and last season the plants made a satisfactory growth but this season they are not doing so well and I wonder if sheep manure would not be a good fertilizer?

A. Do not use sheep manure with blueberries—it is too rich in nitrogen —but you may use compost, especially if you have put in it *considerable amounts of leaves.*

As you know, you need at least four parts of peat and partly rotted oak leaf mold to one part of sand to get the proper ground for successful blueberry culture. Your soil must be below 5 pH. It is also possible that you do not have enough phosphate in the ground and you should use at least 200 pounds of rock phosphate per acre for the first three or four years. This method is better than artificially acidifying the soil by sulfates. We are opposed to the latter method and suggest the organic way as the best.

APPLE SEEDS

Q. Could you give me the information on how to carry apple, pear and cherry seed through the Winter?

I have the fruit here from which I can secure the seed and would like the best methods in which to produce them.

I have been cutting them open with my knife, taking the seed out by hand, drying them in the shade, placing them in a sack. In December I put them in 18 to 24 inch slats on a layer of sand, layer of seed, layer of charcoal, layer of sand and a layer of charcoal and etc., until I have from three to four layers of seed in each slat. Then they are placed in cold storage until spring and planted after the danger of frost is past.

If you can give me any better methods of handling them, would appreciate it as I have not been getting over 5% of my seeds up.

W. H. B., Baileyton, Ala.

A. Apple and pear seed must be exposed to freezes. Cold storage is not enough because it does not go below freezing point. I wonder, however, whether Alabama is the suitable climate for raising apples, pears and cherries and should suggest that you write about it to your Experiment Station at Auburn. Cherries must be grafted, at any rate.

—o—

POTASH

Q. Would you please advise me what fertilizing material can be used to add potasium to the soil in organic gardening.

F. D. D., Woodbury, N. J.

A. By placing six inches of green matter to every two inches of stable manure in your compost heap, you supply adequate amounts of potassium for gardening purposes. Once the moisture of green plants is eliminated and the material is broken down, a great percentage of the solids consists of potassium and there is no need for adding it to the garden in any other way.

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GROWTH HORMONES

Q. Will you please give me your opinion on the use of Hormone Preparations? Is their use permissible with a 100% organic gardening convert?

S. P., Garibaldi, Oregon.

A. To judge from a series of Government research pieces, the opinion on growth stimulants is very much divided. Some experiments report no success at all, while others find that certain plants do root more easily if hormone preparations are used. I, myself, had no success with them and feel that while these preparations would be permissible from an organic point of view, they are not necessary where good compost is made in which manure has been used. Animal manure contains growth hormones which are preferable to synthetic hormones. I might add that even human urine has the same quality.

—o—

SALT IN THE GARDEN

Q. I was told by a gardener last summer to put 1½ lbs. salt in and around the roots of fruit trees, 6" to 8" in diameter. That would prevent the tree from being attacked by insects. Do you know if salt is of any value or would it do harm?

S. K., Dayton, Ohio.

A. I would not use salt around fruit trees since it does not do any good but may often do harm. The only insects it would keep away would be probably ants.

—o—

MANURES

Q. Let me know if you can use treated sheep manure, purchased from a fertilizer house, in making compost, and how you would use droppings from poultry?

A. C. A., Albuquerque, N. M.

A. Droppings from poultry are either pure material on a dropping board or mixed with litter on the floor. Chicken manure in the pure form will do very well when used on the green matter in soluble form. By being diluted with water, it will envelop all the weeds and clippings and cause more rapid decay then when applied as a layer in dried form.

Chicken manure contains more nitrogen than any of the other manures and a one inch layer would be enough if the layer system is used. When mixed with litter, this problem does, of course, not arise and you can easily apply a two inch layer.

Sheep manure is a suitable substitute and can be either sprinkled in a thin layer on the green matter or applied in liquid form. But watch out that it is not chemically treated.

—o—

WEAK STEMS

Q. Living on a farm we have an abundant supply of fresh and decayed pen manure, plus plenty of tree leaves, high quality Peat Muck soil plus a large amount of decayed logs and stumps.

Would like to know what to do to increase the stiffness of stems in flowers used for cutting. I am having trouble with crooked stems. Have you any suggestion?

M. B., R. I., Elkhart, Ind.

A. All the material you have can be easily composted by mixing it according to our instructions in the compost booklet. Be sure, however, to add some lime. If your flowers have weak stems, your soil is either too rich in nitrogen, forcing too quick a growth, or lacks some essential minerals, possibly calcium or silica. By spreading some lime on the land, you may get greater stiffness. It may also be good to apply some phosphate material, preferably phosphate rock, which somewhat checks the effect of nitrogen.

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A list of the present year's publications shows what a wide range is covered by the Gardener's Book Club. We first issued *The Fruit Orchard,* abounding with practical information and unusual data on fruit growing. The next booklet was derived from our editorial work in Organic Gardening, bringing *Questions and Answers on Compost.* Then a small encyclopedia was written by Dr. Meyer on *Leaves And What They Do.* This booklet was richly illustrated, as was Professor Headstrom's book, *Animals and the Gardener,* which followed as No. 4. During the fifth month, members were surprised by a beautifully printed book, dramatically written by J. I. Rodale, entitled *Sunflower Seed —The Miracle Food.* It goes without saying that so much interesting information could never be packed in magazine articles. Then plant breeding had to be looked into. and Mr. Roger W. Smith wrote *Luther Burbank.* During the seventh month, members received one of the most astounding gardening books ever written, *Root Development of Vegetable Crops* by Professors Weaver and Bruner, a well-known classic and practically unavailable until this reissue in condensed form. But nothing of the important substance has been trimmed off the book. No. 8 is the famous earthworm classic, *Our Friend, The Earthworm* by George Sheffield Oliver, which has long been out of print. No. 9, a series of new and selected works by Sir Albert Howard, entitled *The War in the Soil,* represents a magnificent summary of the organic cause.

No. 10 will be Dr. Pfeiffer's *Weeds And What They Tell Us,* an invaluable guide for gardener, farmer, and would-be buyer of land. For here an expert deals with weeds as indicators of soil conditions.

Just to give a few examples, *Weeds And What They Tell Us* will sell at 75 cents, *Root Development of Vegetable Crops* costs 50 cents. *Our Friend The Earthworm,* costs $1.00. Yet, by joining the Gardener's Book Club, you will obtain *TWELVE* such books every year at 25 cents each.

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The Critics Hail

Pay Dirt

by J. I. RODALE

PAY DIRT, *Farming & Gardening with Composts,* which we published late in October, is making a deep impression on America's farmers and gardeners. The critics of farm and garden papers, and critics of literary and general papers and magazines — amateur or professional gardeners themselves — have hailed it as a most important book for everybody to read. Here are brief quotations from a few of many reviews. If you haven't read PAY DIRT you are missing something good.

"PAY DIRT is an exciting and important book both for farmers and gardeners."
—Richardson Wright, Editor,
House and Garden.

"Rodale has certainly hit the bull's eye. His conclusions pertaining to soil management are based entirely upon the fundamental laws of nature, consequently they cannot be other than sound. The book is a clarion call of a new agriculture . . ."
—Joseph A. Cocannouer, author of
Trampling Out the Vintage, and
noted agriculturist.

"This is a book provocative of thought and is worthy of study by all who till the soil."
—*Nashville Tennessean,* Floyd Bralliar,
Garden Editor.

"His theories are based on observation and experiment in countries as different as England, India, China, and among various race groups. Everywhere the story is the same, only organic fertilization (compost) can put into our foods what we must get out of them. Should go on the shelf between PLOWMAN'S FOLLY and PLEASANT VALLEY."
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—Robert S. Lemmon in
N. Y. Herald Tribune.

"This will give a good case of the jitters to all backyard gardeners, as well as to all farmers, who have been playing it the easy way by using chemical fertilizers, and it will very likely send them back to the compost heap. It also proves that what you and I don't know about the art of composting not only would fill but has filled a book. The author, furthermore, can keep you up till all hours reading about the life and works of the earthworm, and that is a neat trick."
The New Yorker.

"PAY DIRT, by the editor of ORGANIC GARDENING magazine, is an invitation to agricultural revolution."
—William J. Gibbons in *America.*

"Counting in a recent foxhole edition of *Plowman's Folly,* put out to the troops, that book has had a run of over 500,000. I hope Rodale's book has as great a sale. It is an excellent, provocative piece of work."
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The New York Times Book Review.

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